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ON THE EFFECTS OF ARTS, TRADES, AND PROFESSIONS, AS WELL AS HABITS OF LIVING, ON HEALTH AND LONGEVITY.

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No. II.

Before we enter upon an examination of the effects of particular trades and professions on health and longevity, it seems proper that we should take a more general survey of our subject, and present those grand results which have been obtained by various observers and writers on medical statistics, in different parts of the world, and especially such as apply to our own country. The mechanic and the laborer are interested also in learning the amount of sickness which each one may rationally expect in the course of a year, so that they may be prepared to meet such casualties, free from pecuniary embarrassment and mental anxiety. Fortunately, since the establishment of beneficial societies in Europe and this country, we have the necessary data by which to calculate with considerable accuracy the liabilities to sickness among the working classes. The English societies have arranged the different degrees of illness under three distinct heads, viz :—

1. *Bed-fast sickness.*—Where the individual is incapable of exertion, and confined chiefly to bed.

2. *Walking sickness.*—When the patient is unable to work, but keeps about.

3. *Permanent sickness.*—Where the patient has a chronic disease, as palsy, or dropsy, or is maimed, or incurable.

Between the ages of 30 and 40, it is found that out of every 100, 1.32 are sick in the Scotch societies, and 1.83, or nearly 2 per cent, in the English. Between the ages of 60 and 70, 10.8 are ill in the former, and 11.26 in the latter; showing that the amount of sickness, as we might expect, increases with the age. Taking the average of all ages, 2.45 in the Scotch societies, and 2.76 in the English are sick. Many persons, however, are obliged to labor, whose health is far from being good. Were their circumstances easy, they would doubtless be found on the sick list. Thus Dr. Forbes ascertained, that of 120 Cornish miners in actual employment, only 68 had good health: of the remaining half, 26 had difficulty of breathing, 14 pain in the chest, 10 pain of stomach and bowels, 5 lumbago, &c.

In the years 1830, '31, and '32, returns were made from the various dock-yards in England, by which it appeared that 1 man in 6 is seriously hurt, 2 in 5 fall ill annually; each man, on an average, has an attack of illness, either spontaneous or caused by external injury, every two years; and on an average, each disease lasts 14 days. Out of 21,000 laborers employed in the dock-yards in England, 2 per cent, or more than 420, are constantly kept at home by diseases, two-thirds of which are independent of accidents.

A very valuable document was published in England, in 1823, in the form of a large volume; being a report of the state of health among the men employed by the East India Company in London, 2461 in number. As each patient on the sick list is seen every day by the surgeon, (being allowed 1*s.* 6*d.* sterling per day while unable to labor) he remains no longer absent than the case requires. From these data, Dr. Mitchell, the reporter, calculates the following results, which embrace a period of ten successive years. A date was kept of every death, as well as the time when any laborer ceased to be employed, by being superannuated, pensioned, dismissed, or by voluntarily leaving the service of the Company.

Table of the Duration of Sickness per annum, for every Age from 16 to 81.

AGE.	Aver. duration of sickness per ann. for every man employed	Aver. duration of sickness for every man sick.	AGE.	Aver. duration of sickness per ann. for every man employed	Avera. duration of sickness for every man sick.
	Days.	Days.		Days.	Days.
Under 21	4.02	13.96	51 to 61	7.00	28.60
21 to 31	4.94	18.70	61 to 71	10.08	29.07
31 to 41	5.06	22.63	71 to 81	11.63	31.77
41 to 51	5.31	23.21			

It appeared from other calculations, that the annual rate of mortality was 3.13 per cent. Amongst the laborers from 40 to 50 years of age, the annual mortality was 2.43; whilst among the male population of London generally it was 2.54: although the mortality under 40 was less than the general mortality of London, yet above 40 it was much higher. Between 40 and 50 it was 67 per cent, and between 50 and 60 as much as 82 per cent higher than the mortality at the same ages in all England.

Dr. M. does not attempt to explain this remarkable fact; but states, on the other hand, that the men were well supplied with food and clothing; that their work, without being hard, insured regular muscular exercise; and in sickness, that they had rest and proper medical attendance. One fact however is mentioned by another writer, which to our mind is of far more importance than some would perhaps attach to it; and that is, the uncommonly free use among the men of intoxicating drinks, especially malt liquors. The extreme unhealthiness of the latter, especially their tendency to render slight wounds and injuries fatal, has been noticed particularly by Sir Astley Cooper, Dr. Trotter, Dr. McNish, and other medical writers; and we have no doubt that the increased mortality among the East India Company's laborers, above 40, is due chiefly to this cause.

Of these 2461 laborers, 10 per cent were pensioned in the course of ten years; 8 per cent were discharged or quitted the service; 1 in 4 had an attack of sickness; 1 in 60 was constantly on the sick list; 1 in 21 was a pensioner; and 1 in 6 of the pensioners died annually.

What we would call the *morbility*, or liability to sickness, of

any population, depends much on local circumstances, which may render a situation salubrious or unhealthy. Taking our country as a whole, it will not perhaps compare with England for salubrity; but *there*, calculations from very extensive data prove, that 100 of the efficient male population are not liable to more than 25 severe attacks of disease in the year. Every *four* years, each man is liable to a serious and protracted disease, disabling him from labor; but this does not include syphilis, or accidents, or the numerous ailments which cause men to apply for medical aid while able to pursue their work, all of which would probably raise to 50 per cent the proportion of the population attacked annually.

Mr. Finlaison, the Actuary of the English national debt, has shown, from very extensive data, that among the industrious poor of London, members of benefit societies, out of 1,000,000 of males, the proportion constantly sick at the age of 23, is 19,410; at 28, 19,670; at 33, 19,400; at 38, 23,870; at 43, 26,260; at 48, 26,140; at 53, 27,060; at 58, 36,980; at 63, 57,000; at 68, 108,040; and at 73 and upwards, 317,230. Thus we see that from 23 to 33 there is no increase of sickness; from 33 to 43, the increase is 6860, compared with the preceding ten years; from 43 to 53 the increase is only 800; from 53 to 63 the increase is 29,940; from 63 to 73 it is 260,230!

In the Portsmouth dock-yard, 37.8 per cent of the men fall ill, and 16 per cent meet with accidents in the year. In the Plymouth dock-yard, out of 2147 cases, 635 did not exceed 3 days duration; and if these be subtracted, the proportion attacked will be only 24 per cent. The surgeon of the Liverpool Beneficial Society reports 57.2 per cent of the members as having received medical advice in the year, of whom 8 per cent met with accidents: these, of course, belonged to all the different arts and trades. In the Deanston cotton works in Scotland, after deducting cases of less than three days duration, the annual attacks of sickness among males was 20 per cent; among females, 44 per cent. This would seem to show, either that females are more liable to attacks of disease, or that they apply for medical advice and give over working on slighter occasions than males.

We have seen that the average duration of sickness among the men employed in the English dock-yards, was 14 days; among the East India Company's laborers it was 22 days; in the English hospitals, 39 days; in the Paris hospitals, 35 days. These institutions, as is well known, receive the most severe cases; often, those of a chronic character; and in numerous instances, those that are incurable.

In this country, the results, so far as we have been able to ascertain facts on the subject, do not differ greatly, in our principal cities, from those above given; but taking the country at large, they are considerably more unfavorable. In large districts, bilious, remittent and intermittent fevers prevail to a great extent. For example: the aggregate mean strength of the U. States Army for the last year, according to the Surgeon General's Report, was 8950 men; the number of attacks of sickness during the year was 22,248, and the total of deaths 214; showing that the proportion of cases of disease to the number of men in service was as $2\frac{1}{2}$ to 1, or 249 per cent; the ratio of deaths to the number of men as 1 to 42, or $2\frac{4}{10}$ per cent; and the proportion of deaths 1 to 107, or a fraction less than 1 per cent. This is a very low mortality, when we consider that large numbers of the troops were employed in Florida and other unhealthy districts, during the sickly season, and speaks highly in favor of the medical skill of our army surgeons.

The average number of deaths among all the patients treated in the British hospitals, both city and country, is about 6 per cent; the lowest being 3, and the highest 9 per cent. It has also been ascertained—1. That the mean duration of each case increases as age advances; and—2. That the mortality among the attacked augments with age, at the same rate as the mortality among the entire number living. The mortality among the patients treated in American hospitals is rather less than in the European.

Professor Caspar, of Berlin, has devoted much attention to the subject of medical statistics, and has drawn up the following table as the result of his investigations. Taking 100 individuals in each calling, the number who attained the age of 70 have been among—

Divines	42
Agriculturists	40
Employed in high offices	35
Mercantile persons and trades	35
Military men	32
Employed in lower departments	32
Advocates	29
Artists	28
Teachers and Professors	27
Medical Practitioners	24

From this table, it seems that the probable duration of life is greatest among divines, and least among physicians. The causes of this low scale of vitality among medical men are, doubtless, great physical and moral exertion, exposures to vicissitudes of weather, fatigue, loss of sleep, irregularity of meals, mental affections, particularly anxiety of mind, contagion, &c. most of which are constantly recurring, and sapping the vital powers.

Taking 1000 divines and 1000 physicians, whose names had been collected indiscriminately throughout Prussia, the following table exhibits the number that died between certain periods:

	DEATHS.	
Ages.	Physicians.	Divines.
23 to 32	82	43
33 to 42	149	58
43 to 52	160	64
53 to 62	210	182
63 to 72	228	328
73 to 82	141	255
83 to 92	30	70
	1000	1000

From as complete an examination as we have been able to make of the comparative mortality of the two professions in the United States and Great Britain, we are satisfied that nearly the same ratio exists in both countries. In no country on the globe are the duties of the practicing physician more arduous

or trying to the health than in our own, particularly in the thinly settled districts of our Western states and territories; and in our Southern cities, the average duration of the lives of medical men, after entering on the practice of their profession, is still more disproportioned to that of the other classes.

Owing to the want of sufficient data, we are unable to give the comparative mortality among those pursuing the different arts and trades; yet an observation of many years has put us in possession of a sufficient number of facts to determine with considerable accuracy as to their relative salubrity. These results, with appropriate comments, will be presented hereafter.

The mortality of various countries differs very materially. Dr. Hawkins gives the average mortality of the Pays du Vaud as 1 in 49; of Sweden and Holland, 1 in 48; of Russia, 1 in 41; of France, 1 in 40; of Austria, 1 in 38; of Prussia and Naples, 1 in 33 to 35; and of South America, 1 in 30. The same writer very erroneously estimates the mortality of this country as 1 in 30, while the American Almanac makes it 1 in 50: our own calculations make it 1 in 56. Professor Dunglison estimates the annual mortality of England and Wales at 1 in 58; varying however in the different counties, from 1 in 47 in Middlesex to 1 in 83 in Anglesey and Pembroke. Late calculations show that the average mortality in many parts of New England is as low as in any part of Great Britain.

It has also been found that there is no exact ratio between the mortality and the longevity of a district, although the proportionate mortality will be greater where the duration of life is less. Thus some of the counties of England, which are the most favorable to longevity, are not those in which the mortality is least. And the same is true in this country. Princess Anne county, in Virginia, which abounds in malarious diseases, at the last census had, in a population of every 20,000, 24 slaves of 100 years and upwards; which probably exceeds the ratio of centennarians in the same population in any part of the United States. It is however worthy of remark, that the number of colored persons who attain the age of 100 and upwards, bears a large ratio to the whites in every country; and what is very remarkable, the proportion of slaves that reach this period,

compared with the free colored race, is in the ratio of 14 to 1.*

Fodere estimates that the value of life is one-third greater in non-marshy districts than in large cities; and Hufeland infers that the mortality in cities may be estimated at 1 in 25 or 30, whilst in the country it is about 1 in 40 or 50. In Philadelphia it is 1 in 47; in Boston, 1 in 42; in Baltimore, 1 in 41; in New-York, 1 in 37; in Charleston, 1 in 36.

In New England, according to calculations made by different physicians in different parts, the annual mortality is as low as 1 in 70. The following is the ratio of mortality in the several places mentioned:—Rocky Hill, (Weathersfield, Ct.) average for 46 years, 1 in 71; 1 in $6\frac{1}{3}$ of the deaths being from consumption. Townsend, Vermont, average of 11 years, 1 in 68. Weathersfield, Ct. average of 64 years, 1 in 64. Hartford, Ct. 1 in 56; New Haven, Ct. 1 in 58; Middletown, Ct. 1 in 68; Portsmouth, N. H. 1 in 68; Worcester, Mass. 1 in 61, taking an average of 4 years. Quincy, Mass. average of 9 years past, 1 in 69.

The following is a *sample* of the numerous facts which attest the great longevity of the people of New England:—In the village of Rocky Hill, Ct. of the 705 deaths that have occurred during a period of 46 years, 157 occurred after 70, or 1 in $4\frac{1}{2}$; and 1 in 11 arrived at 80 and upwards. (*Boston Med. & Surg. Jour.* passim.)

It appears from the Prussian statistical tables, that out of a million living male births, there will die in the first year of life 180,492 infants; and out of the like number of living female births there will die 154,705 infants.

From calculations made by Mr. Finlaison, on 9347 lives and 4870 deaths of annuitants recorded by the British Life Assurance Societies, it appears that the mortality is at a minimum at the age of 13, from whence it rises until the age of 23; from which

* At the census of 1830, New England contained a population of 1,954,704, including 20,000 negroes, and only 35 persons over 100 years of age. The same census gave 738,470 as the population of North Carolina, of whom 304 had attained the age of 100 years and upwards. The ratio of the first being 1 in 55,848; and of the second, 1 in 2425. France, with a population of 36,000,000, contained only 537 persons over 100 years of age; being 1 in 67,048.

point it declines to the age of 34; and from this it again rises until 48, when it is the same as at the age of 23. In other words:—1. The rate of mortality falls to a minimum at the close of the period of childhood.—2. From this point the mortality rises till the termination of adolescence, or the commencement of adult age.—3. From the commencement of adult age the mortality again declines, and continues to decline to the period of perfect maturity.—4. From the period of perfect maturity the mortality rises, and uniformly, without a single exception, returns at the age of 48 to the point at which it stood at the termination of adolescence. The period of infancy includes precisely 3 years; that of childhood, 10 years; and that of adolescence, 10 years: making in all, 23 years. The interval between the period of adult age, and that when life just begins to decline from its meridian, includes a term of 24 years; so that a period greater than all the other epochs of life from birth to adult age is enjoyed, during which mortality makes no advance whatever. This epoch of maturity, during which mortality is stationary, may be protracted, while the other epochs are definitely limited. Thus we see some persons apparently younger at 60, or even 70, than others are at 50.

The habits of living, &c. in the early periods of life, have a great influence in hastening or retarding those physiological changes on which age depends. To illustrate:

Out of a million, 180,492 die the 1st year; 5742 the 13th; 15,074 the 23d; 11,707 the 34th; 14,870 the 48th; 29,185 the 58th; 61,741 the 68th; 114,255 the 78th; 246,803 the 88th: at 84, about the same number die as during the 1st year of infancy. These calculations are not without interest to those who desire to attain great longevity, as they show that the extension of human life depends on prolonging the period of maturity, and not that of juvenility nor senility, which are fixed.

The chief cause of the increased insalubrity of cities is ascertained to be the vitiation of the atmosphere. Three hundred thousand people require 300,000,000 cubic feet of pure air daily; but how can this be obtained, where gases, and effluvia, and poisonous exhalations from a thousand sources are pent up and prevented from diffusion, by narrow streets, and high walls,

and innumerable inclosures? Some of these gases, such as the carbonic acid, are heavier than the atmospheric air, and of course gravitate so low as not to be disturbed by the aërial currents which move above the houses. The evil, to a certain extent, is unavoidable; but much can be done, by way of prevention, by removing from cities those causes which produce the poisonous exhalations. Slaughter houses, and other establishments which give rise to animal or vegetable effluvia, should be removed; streets should be kept clean by sweeping, and by daily currents of water admitted to the gutters and sewers; public squares should be opened; narrow streets widened; trees, which absorb carbonic acid in large quantities, should be extensively planted; and sewers should be constructed to carry off below the earth the filth which is now permitted to stagnate and decompose on the surface. All these measures are practical; and there can be no doubt that if carried into execution, the annual mortality of large cities would be diminished from 10 to 20 per cent. When we come to treat of public hygiene, we shall enter on a more minute investigation of this important subject.

[For the American Repertory.]

ON THE STEAM-ENGINE.

(CONTINUED.)

The business of a civil engineer has been defined, "the useful application of the exact sciences to the common purposes of life." The successful fulfillment of his duties, then, depends on two distinct conditions:—

1. The engineer must understand the exact sciences relating to the business he undertakes.

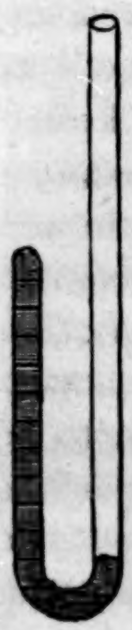
2. The sciences to be applied must be exact.

Now, as the last of these conditions has never been attained on this subject, the former is impossible. Hence the obscurity of this branch of science, and the contradictory opinions thereon, frequently amounting to infatuation. As our object in these papers is to be truly and practically useful to society, our endeavors will extend to the substitution of plain facts and sub-

stantial truths for the uncertain theories and certain errors hitherto prevailing. Thus, by clearing the mind from what is mistaken, removing obscurity by intelligible statements alone, we may hope to secure that desirable object—the speedy and universal improvement of the steam-engine. Hence, there arise two especial reasons for treating this subject much at length and very minutely; and these reasons must supply a sufficient excuse, if any be necessary, for our seeming prolixity.

The first and principal reason is derived from the immense and increasing importance of the subject to mankind. Its present certain and numerous imperfections are proved by its contradictions, and hence its probable improvement, from a full, careful and unprejudiced review of its theoretical and actual constitution, may be expected.

The second reason is derived from the consideration, that to be really useful, we must convince the most prejudiced of readers, and the most heterogeneous and opposite characters imaginable. The theoretical and non-practical or *learned* class, par excellence, including the writers at the head of this article, who expounding and misexpounding many things unheeded by practical men, confuse the latter, and thence assume infallibility; while the practical classes, whose opinions have been created and fortified by years of experience, have become equally prejudiced in favor of some peculiar and isolated practice, and as impatient of contradiction as theorists: It is thus improvement is hindered and errors perpetuated.



To correct or uproot these errors, to obtain increased and to extend real information, we must patiently compare the opposite theories together, and both, with reason. To obtain better results, let us compare the opposite practical opinions with each other, and all with experiment.

Provide a leaden boiler 4 or 5 inches diameter, and 12 inches deep, nearly filled with dilute sulphuric acid, diluted till it just boils at 320°; then take a stout barometer tube; seal one end, and bend 6 inches of the sealed end thus; and graduating it into twelve equal parts, fill the graduated end with mercury, and also

1 inch of the longer end of the tube; then pass a drop of water through the mercury to the sealed end of the tube.

Now, suspending the tube at a convenient height, and inserting its lower end into the dilute acid by elevating the boiler, apply heat, so as to cause the acid to simmer, and maintain a constant temperature, when the drop of water, expanding into steam, will expel the mercury from the sealed end of the tube, and also all the water except a small portion thereof, which, converted into steam, remains in and occupies the graduated end of the tube, compressed by seven inches mercury, and also by atmospheric pressure equal to thirty inches mercury. The steam then remaining in the tube is of just sufficient force or elasticity to balance 37 inches mercury, and in just sufficient volume to fill the graduated tube.

Connecting other barometer tubes to the longer end of the sealed tube, and adding successively such additional columns of mercury as may be each equal to 37 inches when measured from the lower compressed surface of steam, while the acid bath is maintained at a constant temperature, we shall find on adding one column of 37 inches, we double the pressure on the steam, and reduce its volume just one half; on adding another column, we treble the pressure and reduce the volume of steam to one third; on adding another column, we quadruple the pressure, and reduce the column of steam to one fourth.

We shall find also, by removing the boiler for an instant to permit inspection of the graduated tube, that on removing or repeating these pressures, a constant and exact corresponding increase or decrease of the volume of steam is perceptible.

Hence, then, we experimentally ascertain within a heated cylinder, *the volume of steam to be proportional to the pressure*, and that the opposite opinions of Messrs. Renwick and Palmer are alike unfounded. Now, the condition of expanding steam in a heated steam-engine cylinder, (which, steadily at work and amply supplied with steam, is necessarily as hot as the hottest or unexpanded steam therein,) must be fairly assumed to be correctly though minutely represented by the condition of the steam within the aforesaid graduated tube, maintained at a constant temperature; wherein it is evident no heat or power

was latent or lost, or could be so, during the expansion of the steam from a small to a larger volume; but the steam, on the contrary, always retained its full and proper quantity of heat, and a power proportioned to its volume, exhibiting a gradually decreasing force consequent on expanding a definite quantity of elastic fluid into a larger space, but which expansion or enlargement is utterly inconsistent with any actual or observed loss of heat or of power; because, as we well know, the steam may be restored at will, by contraction into its former volume, heat and elasticity, by renewed compression alone, as shown in our experiment.

How idle, then, are the arguments and apprehensions that heat becomes latent, or that power is lost on the expansion of steam, which in an engine is merely a particular application—an advantageous and scientific expenditure of power! How unfounded, then, are the theories of the writers at the head of these papers! How much plainer, simpler and better are facts than speculations, however ostentatious!

It has been determined by chemists, that "the bulk of all elastic fluids or gases are ever inversely as the pressure to which they are subjected, while the temperature remains constant;" and this property and condition of the gases corresponds exactly with the condition of steam as detailed in our experiment: for, as we have previously shown, steam within a heated cylinder never becomes latent: it remains subject to the same laws, and has the same elastic force under pressure as the gases—all which is apparent enough, and has been and can be easily proved by our experiment.

It really seems no easy task to decide whether the science of the non-practical classes most *promotes* or *retards* the general improvement of the steam-engine, (in which so much more has been effected by the persevering, practical Cornish engineers, than by all others;) so many unfounded assumptions having been made by learned men, from which they always pretend to prove without doubt or contradiction (as in Mr. Palmer's case) that one of the most valuable properties of steam with which we are acquainted—its expansive force—is *valueless and useless*. For Mr. Palmer, basing his arguments upon *his* science, re-

iterates (ad nauseam) what the British engineers credit and sanction, and what every learned man expounds with wonderful solemnity—that the joint sum of the latent or insensible heat in steam, and the sensible heat therein, is an invariable quantity; now, as we have incontestibly proved there is *no heat latent in steam*, it necessarily follows, however sanctioned or solemnly propounded, that all deductions from these assumptions are visionary, deceitful, and infinitely worse than useless.

That heat in steam of every density is an invariable quantity, is as indubitably shown by our experiment as confirmed by those learned but mistaken opinions of its quality; but just as much as nature is more simple and correct in her arrangements than philosophers in their sophisms, so are the facts more simple, convincing and elegant, that the heat in steam of every density is ever active, and invariable in quantity, and the volume and temperature thereof ever exactly proportioned to its elasticity; and thus, by analysis, steam is proved to be a more simple elementary compound, and a more regular, powerful and valuable agent, than philosophers have contemplated in their misconceptions of its nature.

What singular and different results arise from the mistakes of practical engineers, or of theorists! Should the former omit any thing essential in his construction, or admit any thing unessential therein, he must supply the one or remove the other before his machinery will act.

How different the conduct of the non-practical theorist! How tenacious of opinion once formed! How proudly does he disdain to add or diminish an iota from his solemn dictum! How incomprehensible (as Mr. Palmer has it) is any fact, however authentic or notorious, that contradicts the long-cherished, and therefore unquestionable inspirations of theorists! For instance What is more familiar, accredited, or appealed to by theorists, than the thermometer, (*anglice*, heat-measure) and what can be more loose, trifling or erroneous than attaching such a name to such an instrument? Were it called an indicator of heat, as it only ought to have been, instead of a measurer of heat, unnumbered errors, arising from the mistaken notions of steam, incalculable losses, extreme miseries, and national disgraces,

resulting from this misapprehension alone, would have been spared to society.

The distilling apparatus in our former paper is evidently a true and certain measure of heat, for as it invariably separates from steam of any and of every density, the same exact quantity of heat from the same corresponding quantity of water, no possible doubt can be entertained of the correctness of its indications: hence, then, this distilling apparatus is truly entitled to the expressive and comprehensive term, "thermometer." Now, if it is so rightly entitled, by what name should the present mercurial instrument be distinguished? for by comparing its performance with its name, by testing it with the *true thermometer*, we find it the most unaccountably variable and inconstant instrument imaginable; for, compared with a true instrument, within the range of fifty atmospheres, its measure of the same quantity of heat is ever varying in the amazing disproportions of 1 to 180. How erroneous, then, this name! How deceitful and dangerous this application of the term to such an instrument—an instrument of perpetual reference in the most delicate and important experiments that science can devise!

This complicated and deceptive action of the mercurial thermometer evidently depends on the different rates of expansion by heat between mercury and glass. In Turner's Chemistry, it is stated that mercury and all fluids expand in volume with an increasing ratio at increasing temperatures; and that glass, having the same tendency to increase more in volume with increasing temperature, and having nearly the same increasing ratio as mercury between 32 and 212°, the correct action of the thermometer remains nearly unaffected thereby. How different this (if it be so) from the higher temperatures we have quoted, where the capacity of the glass bulb must either have increased faster than the volume of mercury in the ratio of 180 to 1, or both have been proportionally affected in some intermediate but equivalent degree!

As the physical cause for this great anomaly is unknown, it seems singular it has been hitherto so disregarded, as it is evidently a curious subject, well deserving the notice of any

institution aspiring to the term scientific: we cannot refrain from commending it to the notice and attention of our friends of the Mechanics' Institute of New-York, for elucidation.

Improper as is the name, and misleading as has been the nature of the mercurial thermometer, yet in skilful hands, with the aid of Ure's or of Dalton's tables of elasticities and temperatures of steam, it affords a ready means of ascertaining the internal state and power of a working engine, by applying it to the various parts thereof; and in this way may many matters now unknown or disputed, be quickly, quietly, and satisfactorily disposed of, or become plainly exhibited.

As one example of the utility of this ready mode of acquiring information, we will test by a thermometer the actual value of a recently patented improvement of the steam-engine, of great celebrity and greater promise, being the invention of one of the leading members of the British Society of Civil Engineers, who is at the head of one of the largest steam-engine factories in London, where of course every facility may be supposed to exist for testing the value of any improvement previous to submitting it to public notice or animadversion.

Thus: the Messrs. Seaward propose heating the water in its passage from the hot well of the engine to the boiler 60°, by the steam in its exit from the cylinder to the condenser, expecting and promising a saving of no less than $\frac{1}{7}$th of the fuel thereby; and all this they propose effecting by causing the water to travel through thin copper tubes inclosed within the eduction pipes of the engine; now, the simple application of a thermometer to those pipes will in a few minutes show their temperature to be but little if any in excess of the temperature of the hot well, from which the water is fed to the boiler; and hence we see the water cannot be heated a single degree by this therefore useless contrivance, unless some improper, say wire-drawn, interruption of the steam in its passage from the cylinder to the condenser be interposed, which would be so prejudicial to the power of the engine, that to suppose it to be practiced by any honest engineer is impossible.

How easily might all this have been fore-known, from the fact now so apparent, as every part of the eduction pipe is alike

a part of the vacuum, so called; and as every part of this vacuum is alike occupied by and alike warmed by steam of a corresponding elasticity and temperature, so no part thereof can be hotter than another.

The same discovery was patented by another ingenious mechanic, Mr. Hase, of Saxthorpe, Norfolk, England, and applied to an engine for the Norwich Flour Company, forty years ago; and Mr. Hase promised the same advantages, and expected of course the same profit then as the Messrs. Seaward are now anticipating. Surely the lawyers who contrived, and so kindly, the dear English patent laws for the great encouragement of genius, as they have it, can alone discover that genius is certainly rewarded.

We have observed a thermometer attached to the eduction pipe of a Watt's pumping engine to stand at 90°, and not to differ a degree from the temperature of the hot well; and we have as often seen the same engine continue steadily at work for some time, with the safety-valves of the boilers thrown open, and with the small greasing-cock in the cylinder-cover unclosed, and consequently admitting a constant, small current of air to enter the steam-engine cylinder. Thus the engine was working with steam of considerably less elasticity than atmospheric (which elasticity might have been easily ascertained from the tables by the aid of the mercurial thermometer); hence the estimates of Professor Renwick, however he obtained them, are very erroneous, viz. that pumping engines, loaded as they are with 10 lbs. per inch, require a steam pressure of 17½ lbs. which we see they do not; and as the difference between the fact and the Professor's statement is so very considerable, this his calculation of the useful effect of low-pressure steam is very much underrated, and only calculated to mislead in a matter of great import.

Again, the Professor as extravagantly overrates the value of high steam as any of the earlier and wildest projectors, by stating (p. 22) "the general law of the expansive force of steam is that while the heat increases in an arithmetical ratio, the expansive energy increases in a geometrical progression." And at p. 23, gives as an exact measure thereof, the tables of Dulong

and Arago, calculated to fifty atmospheres. Our experiments have shown these imaginary laws of heat in steam to be vain dreams, and only innoxious now, because fully exposed.

Having published these tables, accompanied by such plain and unreserved statements as above, it could have been only expected they were intended by the Professor as guides to practice; for if they were not so intended, they would most probably be, as they ever have been, very pernicious. But so far as we can discover, the Professor does not mean any such thing; nor are we able to ascertain with any precision what he does mean, having left this essential matter quite undecided; and making very different assertions in different parts of his treatise, which assuredly is a strange way of treating a subject requiring mathematical accuracy and precision above all things.

What a contrast does the following quotation present to that just quoted from p. 22! At p. 162 he says:—"The density of steam increases nearly as fast as the pressure under which it is generated; did both increase in the same ratio there would be nothing gained by the use of high steam."

Although the Professor is vastly nearer right in p. 162 than at p. 22, the latter law absolutely contradicting the former law, yet our experiments prove him still incorrect and mistaken considerably, as the density of steam is always exactly proportioned to and increases fully as fast as the pressure; and therefore nothing is or can be gained by the use of high steam as such; which is amply though unintentionally certified by the Professor.

We have seen that Professor Renwick not only doubts, but completely contradicts himself on these very important and most essential matters. Not so Mr. Palmer, who states his opinions not only without doubt, but terms his every assertion, however astounding, an established law of nature. Some of these we quote in detail, lest it should appear incredible that they were ever admitted into a scientific journal. At p. 182, he says:—"I care not whether the steam applied as motive power be what is termed atmospheric, or high pressure; whether it be worked expansively, or otherwise; whether condensed or

blown into the atmosphere; whether the engine be of the denomination technically termed single, double, or atmospheric; or, in fact, whether the steam be applied to any other apparatus human ingenuity can devise, even in the absence of all friction."

What quixotic conceit, what indistinct notions, what confused ideas these, for a sober, philosophical civil engineer!

Again, from the same page: "From the aforesaid data I will show that nature herself cannot produce a result (in the absence of all friction, as before premised) amounting to one half of what is stated to be the duty of some of the Cornish engines."

What a delicate appreciation of the credibility of the disinterested Cornish reporters; and what a happy and instructive comparison between the artificial performance of a steam-engine and the unartificial efforts of nature!

Again, from page 183: "Having stated the maximum effect that nature is capable of accomplishing, 44,467,500 lbs. water raised one foot high with one bushel best Newcastle coals, and having shown the maximum effect that can be accomplished by the atmospheric steam generated by a bushel of coals, my next object will be to demonstrate that high-pressure steam, when applied expansively, cannot produce so great an effect as atmospheric steam."

Whoever reads the above quotations, that is capable by education and practice of forming a just opinion thereof, must perceive Mr. Palmer, however otherwise informed, is profoundly ignorant of the subject he has so hardily and so unluckily attempted. In proof of this our assertion, he says, he "cares not whether the steam is expanded or not." Now, as the expansion of steam, doubtless, greatly adds to its useful effect, as we will hereafter show, in crank engines, (Prof. Renwick has stated five times) it is evident to every one well informed on the subject that Mr. Palmer could not have understood the nature or value of the elastic force of steam, which property is in itself as simple and easy of comprehension as the power evolved during the unbending of the main-spring of a watch.

That any individual engineer could be found at this period, so apparently learned or even plausible, yet so really ignorant

of his selected subject, would be incredible on any evidence but his own; or that such vague and confused ideas should be sanctioned by any society of practical men, or that such unfounded and dishonorable detractions from the Cornish engineers should be allowed by their countrymen and fellows, the London Society of Civil Engineers, could never be credited, did they not appear in their own publication.

Let it then ever be remembered how much the successful industry of the Cornish men have added to the wealth of their nation, and how much their successful ingenuity has increased its engineering character, by showing the greatest improvements of the steam-engine, which the London engineers have neither had the sagacity to appreciate or imitate, the liberality to praise, or the prudence to avoid disparaging, while all other engineers behold them with unbounded admiration.

We shall satisfactorily conclude the present paper, and this portion of the subject, by another quotation from Mr. Palmer and the few and necessary observations thereon.

"If the statements given to the public by the Cornish engineers are correct, I dare not trust myself to call nature to account for the undue favoritism she confers upon our Cornish friends, by enabling them to obtain results in Cornwall that the London, Manchester and Birmingham engineers cannot approach; and I shall perhaps be excused from expressing my surprise that the question has not long ago been set at rest, by some one erecting in London or elsewhere an engine capable of raising 70,000,000 lbs. (I will not ask so great a favor as 120,000,000 lbs.) of water, one foot high, by the consumption of one bushel of coals. Let this only be done, and I shall be the first to hail the result as one of the greatest achievements of man over matter, and give the Cornish engineers that meed of praise they would so richly deserve for the benefits conferred on science, or upon the manufactures and commerce at large."

Now, in a late number of the Engineer's Journal, it appears a Cornish pumping engine has been erected at the East London Water Works, that has lifted 72,000,000 lbs. of water a foot high, by the consumption of a bushel of coals, besides the friction of the engine and machinery. This would seem to show

that there was very little cause for or reason in Mr. Palmer's exquisite work, in which he has exhibited nothing creditable to himself or to the Institution of the Civil Engineers, or useful to mankind.

As we have endeavored, so we trust to have fully relieved him from all future trouble of making established laws for nature; and as his relief must thus be very considerable, we hope his gratitude will be proportional. † †

[For the American Repertory.]

ADVANTAGES OF COMPRESSED PEAT.

BY ALEXANDER S. BYRNE.

The properties of peat have been long known to the scientific world, and it is matter of surprise that no attempt has been made at an extensive diffusion of the advantages which it possesses in a *compressed* state. These advantages are so important as to deserve and demand the greatest possible attention in every country where peat abounds. What is more interesting than to give employment to the industrious poor of any country? What so much so at this period as to provide constant and profitable employment for those of Ireland? Great and important as is the discovery to this country, it is so in a more especial degree to Ireland, whose bogs will be rendered as valuable as coal mines, holding out the pleasing hope that in time that unhappy country will become the seat of those arts of which cheap fuel may be said to be the parent. Such, however, would be an effect consequent upon the production and application of compressed peat.

To enumerate all the advantages of compressed peat would appear as one of the delusive hopes with which the present age has teemed: it will therefore be sufficient to explain such as are palpable, and which cannot with reason be doubted.

Peat (sometimes called turf,) consists of vegetable matter, chiefly of the moss family, partially decomposed by the action of water. The dense black turf, or lower stratum of peat bogs, is much contaminated with magnesia, sulphur, iron, earth, &c.

while the upper stratum consists of almost pure vegetable matter. In its natural state it is loose, fibrous, porous and spongy, and contains generally from 30 to 80 per cent of water. The filaments are very strong and elastic; but when decomposed they yield readily to pressure, and break into disjointed pieces like small worms or threads.

From its extreme lightness, and impurity of the lower bed, turf is not generally employed as fuel, or as a useful article in arts and manufactures; but in countries where it abounds, and where coal is scarce, it is cut by the peasantry during the summer season, dried, stacked, and used for domestic purposes. There are many varieties; but in almost every region the top surface consists of pure vegetable fibre, undecomposed; and whether consolidated or not, can be beneficially employed for the production of dyes, pyroligneous acid, distillation, and many other purposes to which wood and vegetable substances are generally applied.

When compressed to the solidity of coal or wood, it can be successfully, beneficially and very profitably employed for the following purposes:

As *fuel;* for this use it is of inestimable value in steam navigation and railroad carriages, effecting in stowage alone a saving of at least one third.

For the production of gas; in which it gives birth to many improvements.

For *smelting ores;* particularly iron, copper, and lead.

For an *improved road;* superior to wood, stone or asphaltum.

For pavements, flooring, pannels, cabinet and ornamental work.

For the manufacture of *paper*, cements, pigments, *dyes*, *pyroligneous acid*, &c.

For lime burning, and many other similar purposes

The cost of production, dependent of course upon localities, must still on all occasions be very small, from the facility with which it is worked; and looking at the price of coal, it is not too much to assume that in all districts where peat is found, it can be raised and compressed 50 per cent cheaper than any other fuel. These facts can be proved upon incontestible evi-

dence, and exhibit one of the sources whence profits must accrue to those who are engaged in applying them.

A great obstacle in the compression of peat is the presence of water and the strength of the vegetable fibre, the resistance from which has been matter of surprise to all who have studied the subject. The superabundant moisture may be easily pressed out in almost any description of press; but this can only be continued to a given point; for when the interstices of the peat are closed up, the resisting force of the confined water and air is so great, and the possibility of their escape so effectually prevented, that the block of peat undergoing pressure becomes itself a hydraulic; and however much pressure may be afterwards applied, the confined water, aided by the strength and elasticity of the fibre, will reäct when the pressure is removed, and force the whole mass back again to the state when the superfluous moisture was removed. This is in fact the starting point; and those who have reached but so far in the art of compression have done very little for the removal of established difficulties.

To overcome these difficulties, many remedies have been proposed. Mr. Charles Williams, of Dublin, proposes to break up the peat to a fine powder, until it assumes the consistence of *pap*. Thus, by destroying the vegetable fibre and all resistance from that source, he presses this pulpy mass into a solid lump, either in perforated boxes or in hair cloths, as in the compression of linseed cake. I have seen some specimens of Mr. Williams's peat denser than oak, and have used coke prepared from this source with extraordinary advantage.

Lord Willoughby d'Eresby, Mr. R. C. Stewart, Dr. Geary, and several others, have successfully applied various presses, with escapes for the confined water from the centre of each block of turf undergoing pressure. Mr. White, of London, (an engineer) has succeeded in extracting a large proportion of water, and in producing an extraordinary hard peat by means of a vacuum. He covers a large perforated surface with peat, and by withdrawing the atmosphere from beneath, he forces a vacuum, extracts the water from within the turf, and obtains a very close substance for domestic and other uses. Prof. Maugham,

the celebrated lecturer at the Polytechnic Institution in London, is explaining this process, and applying it to many branches of manufactures with wonderful effect.

But the most simple and least expensive mode is to *evaporate* the water, and compress the peat *while warm.* By this means not only is the water dispelled, (being converted into steam) but the moisture of the inner threads is so completely rarefied, and the resisting force from the vegetable fibre so entirely destroyed, that compression to any degree of solidity becomes comparatively easy, beside which a principle of cohesion is imparted to the whole mass, which causes it to unite without any further disposition to return, as is the case before the vegetable fibre is destroyed. Upon the same principle, a *warm* blanket can be squeezed perfectly dry; a *cold* one cannot. In fact, it is a universal principle, that water in a state of steam is easily dispelled, and that bodies when warm and damp have a greater disposition to unite than in any other state.

I should therefore recommend this method in preference to any other for the compression of peat: As soon as it is cut from the bog, it should be spread upon a large table, with a fire underneath, that the water may be evaporated; and while the vegetable fibre is still warm and moist, compressed in suitable presses into square blocks. The kind of press is of no consequence; but I have found a monkey or stamper press preferable, as it is very cheap, and can, from its construction, be easily removed from one spot to another.

Two men can cut and compress more than two tons per day, and the cost of necessary machinery would not exceed $100.

In the coking of compressed peat there is much for communication; and more particularly in its application to the manufacture of iron, gas, roads, &c. which will be fully explained in our next paper.

MINUTE OXIDATION OF POLISHED SURFACES OF METALS.

It is not generally known that a polished surface of steel or iron contains an infinitesimal quantity of oxide. This is the

fact, however, as can be clearly proved by a simple experiment. If a polished plate of steel be immersed in mercury, no amalgamation will take place; or if a bar of steel be suddenly broken over mercury, and immediately immersed, the metals will not unite; but if it be broken under the surface of the mercury, they will be found to have amalgamated perfectly: thus clearly demonstrating that fresh surfaces of these metals are slightly oxidized by even momentary exposure to the atmosphere. This fact was first observed by Frederic Hassler.

STEAM-VESSELS NOW BUILDING IN THE UNITED STATES.

Two steam-ships are in progress for the U. S. Government—one in this city, and the other at Philadelphia, the engines for which were planned and are under the immediate superintendence of C. W. Copeland, Esq. chief of this department. The dimensions of the former are as follows:

Length, feet 210
Breadth of beam 40
Depth of hold........................... 24

Two engines, each 250-horse power.

Stroke, feet............................ 10
Diameter of cylinders, inches............ 63
calculated to perform 17 revolutions per minute.
Weight of copper boilers, lbs. 200,000
Weight of bed-plate 13,500

Main shaft of wrought iron, 17 inches diameter and 25 feet 8 inches long. The paddle-wheels entirely of iron, 29 feet 8 inches diameter. Buckets 10 feet.

This vessel has iron bulk-heads, filled in with flannel and white lead. Engines nearly horizontal; the working parts being on an inclined plane of 25 degrees.

The frigate building at Philadelphia agrees in its general measurements with the other. The engines are of the style known as "English marine engines," with 7 feet stroke, and cylinders 75 inches diameter. We understand that Government

has chosen the West Point Foundery, New-York, and Messrs. Merrick & Town, of Philadelphia, to build the machinery.

Two large steam-frigates are also under progress in this city for the Spanish Government; the engines for which are constructing at the Novelty Works, and the hulls at the yard of Messrs. Bell & Brown.

For the American Repertory.

KYANISING TIMBER.

Sir—Your last number contains a notice of an improvement upon Kyan's process for preparing wood, lately adopted by the Manchester and Birmingham Railway Company. Permit me to state that the mode there referred to, which is simply hastening the operation by hydrostatic pressure, has been in successful use for nearly three years at the establishment of Robert L. Stevens, Esq. in Bordentown, N. J. being mostly used for preparing timber for the Camden and Amboy Railroad.

Yours, &c. MIRON.

IMPROVEMENT IN MECHANICAL SURGERY.

We are glad to say that the severe operation of amputating a limb has been greatly improved, in the celerity with which it may be performed, as well as the greater uniformity of its results, from the use of an instrument invented by Dr. E. H. Dixon of this city, and which has received the approbation of a number of our most eminent surgeons.

The statistics both of European and American surgery, show a great predominance of cases wherein either a very slow healing of the divided muscles and integuments, or an actually protruding bone,—owing to insufficient retraction of the parts previous to incision—are the results of amputation, often endangering the life of the patient, and demanding a repetition of the operation. These difficulties are intended to be obviated by the new invention, which is an elastic steel band that encircles the limb immediately above the place designed for the incision. This is graduated and closely adapted by means of cogs affixed

to the slide, and a ratchet-wheel, turned with a key; and when this is applied, a perfectly equal retraction of the integument can be effected as soon as a rapid incision is made; instantly a second one is carried at once to the bone, and the limb sawn off. The plan hitherto has been either to make two large flaps, each of which is fully equal to the surface exposed in the new method; or to dissect up the skin, a most tedious and dreadfully painful operation, and turning it up like the cuff of a coat-sleeve, to cut down to the bone, using the integument saved to cover the exposed surface. This often makes sinuses, that discharge matter for months, and either wear out life, or render a second amputation necessary. The incision formed when the instrument under consideration is used, makes a regular hollow cone, with the bone at the bottom, allowing accurate adaptation of the parts to be made, and a rapid recovery of the patient. We are credibly informed that from 10 to 15 seconds is ample time to perform amputation of the thigh, while it would take the most expert operator as many minutes by either of the old methods.

This is the third instrument of great practical utility that Dr. Dixon has presented to the profession.

RENNIE'S TRAPEZIUM FLOAT.

An extract, containing a brief notice of some experiments made with the new form of propeller invented by Mr. George Rennie, C. E. which appeared in the July number of this journal, has excited much interest among engineers, and elicited requests from several quarters for a more full description of the form and advantages of the invention. This is here endeavored to be given.

For the first we present a diagram, possessing the same proportions relatively as a drawing approved by the inventor, from its describing the exact shape and comparative measurements of the float he considers most efficient; the diagonals being to each other in the proportion of 2 to 3, crossing at right angles, and intersecting at two-thirds of the length

of the longest diagonal, which is placed vertically. The form, as the writer of the extract above referred to observes, is that commonly chosen by nature for the purpose of propulsion, as in the feet of water-fowl and wings of birds; and though we are not quite prepared to go with him to the extent of believing that the success of Mr. Rennie's invention proves the correctness of nature's handiwork, we think it very possible the converse of the proposition may be true.

Several series of experiments, comparative and otherwise, have been undertaken to test the value of this invention. From the results of these, as published in the London journals, the following deductions may be drawn:—

1. That the trapezium float, with an area compared to the rectangular or common float as 1 to 2, offers a resistance as 2 to 3; or as better stated, that with *half* the area of the common float, it presents *two-thirds* as much resistance.

2. That it enters the water without a shock, and leaves it with less than the usual waste of power with which the common float emerges.

3. That the width of the wheel-house, and consequently the resistance of the wind, will be diminished one-third.

4. That the vibratory motion, so disagreeable in most steamers, will be avoided, and in a great degree also the lateral undulations or plungings, that are so straining to boat and engine.

5. That one half of the present cost and weight of paddle-wheels and boxes will be saved.

We confess to a little skepticism upon the first named advantage, which is irreconcilable with all opinions we have hitherto entertained upon the resistance of surfaces of different forms to fluids. Mr. Rennie's reasoning, however, is corroborated by an experiment recorded in the Philosophical Transactions for 1831, where it is stated that though the area of a square was diminished one-fourth by the removal of the corners, its resistance in moving through a fluid was the same.

The last trial of this propeller we have seen noticed, was made with a small steam-boat, to which it was fitted, plying on the river Thames, England. The result was stated to be highly satisfactory, as it confirmed the observations previously made

relating to an increase of speed with a less area of float, smoothness of motion, and absence of all tremulous vibration. The speed obtained was an increase of one-seventh upon the average of several previous trials with the old rectangular floats. The diameter of the wheels, and the distance of the centre of pressure from the axis, were nearly the same with both kinds of propellers.

Permission has been given by the Admiralty to fit a pair of wheels on this plan to one of the Government steam-ships, so that ere long the value of the invention will be determined in the fullest manner.

PRECIPITATING BY GALVANISM.

It is a pleasant duty to record the rapid progress which this discovery is making in usefulness; to note the new and valuable applications of it to the arts and trades. Its history is scarcely a year old, and already have the early bright predictions of its importance been more than realized: the student's researches, the skill of the artificer, constantly give us fresh cause for admiration, and show its applicability to purposes before unthought of by the most speculative.

In this number we give the process by which Mr. Spencer, to whom the art is vitally indebted, precipitates upon wood, plaster, clay, and other non-metallic substances. Equal in usefulness with this, if not so brilliant, is the progress of M. de la Rive, of Geneva, whose efforts have for some time been directed to obtain a precipitate of gold—an application of the art of more value to the Genevese, those skilful workers in the precious metals, than to any other community of artisans in Europe.

M. de la Rive has applied the invention to gilding watch-cases, wheels and plates; spoons, and the inner surfaces of various articles for table use. His operations have been principally upon brass and silver; but he thinks iron may also be gilded; and as that metal is but slightly negative to zinc, suggests that the surface be first covered with a slight coating of silver, by electro-chemical agency, upon which the gold will

precipitate as readily as upon the silver when it is not united to the iron.

The apparatus of M. de la Rive does not differ essentially from that described in the Repertory for July as the one with which Dr. Chilton obtained the electrotype plate that we have given impressions from: there are, however, some modifications of the process in other respects, a knowledge of which may help the experimenter to a successful result. A description of these we subjoin, avoiding the tediously minute details that, it may fairly be presumed, are familiar to every one who shall desire to try the process, whether for pleasure or profit.

Gold, either pure or alloyed in any of the usual proportions, is dissolved in nitro-muriatic acid *(aqua regia)* and the excess of acid is drawn off by moderate heat, until the solution becomes as nearly neutral as possible. Distilled water is then added, to reduce it to the required degree of density; and this forms the bath from which the metal is precepitated. The fluid used to excite galvanic action is prepared by adding

5 or 6 drops of { sulphuric acid, for gilding silver, / nitric acid, for gilding brass or copper, } to a tumbler of water.

A difference of action upon the metal to be gilt, determines the preference expressed for one acid more than the other, for a particular purpose. The water is acidulated only to that point necessary to produce the weakest effective current of electricity, since a more violent action endangers the success of the operation.

To prepare the battery, solder a piece of silver or platinum wire to a narrow strip or ribbon of copper, and attach the latter in the same manner to a piece of purified zinc: to the silver or platinum, join the metal to be precipitated upon, which must previously have been well scoured or polished. Silver is said to take a finer gilding by being first whitened in the fire. With the preparatory arrangements all complete, the operation is thus couducted:—First, dip the subject to be gilded into a tumbler of acidulated water, to remove any foreign matter that may be upon the surface, observing the same rule as before given, to use sulphuric acid for silver, and nitric acid for copper or brass. Now place it in the gold solution of the bath—the zinc being

placed in the other fluid, as usual: let it remain in the solution one or two minutes: remove it thence, and place it for an instant in the acidulated water again, and then forcibly rub it dry with a linen rag. Repeat this order (immersion in the acid mixture—gold solution—acid mixture—and the rubbing,) until the metal receives a sufficient coating of gold, which usually requires five or six applications of the bath.

It is very important that the surface upon which it is intended to precipitate should not be brought in contact with the solution of gold before galvanic action takes place. Thus, in gilding the inside of a cup, the bladder or membranous bag containing the acid and water, being suspended within the cup in a manner that would readily occur to the experimenter, care must be taken in pouring in the metallic solution, to make it pass down the side of the bag, and so form the electrical circuit at the instant of its contact with the cup.

In cases where it is found impracticable to immerse the entire surface to be gilt, portions of it should be placed in the solution alternately, instead of coating any one part to the desired thickness before the others are subjected to the bath. If this be done, observing always to overrun the edge of the previous immersion, the lines of union will be imperceptible. The gilding of cups and other vessels with scolloped or uneven edges, may by this means be rendered easy and perfect.

The color of the precipitate is dependent upon several circumstances: purity of the gold, strength of the solution, and color of the metal gilt. Brass requires a less coating than copper or silver to produce an appearance of equal beauty. M. de la Rive recommends that the solution should be kept at an invariable density as nearly as practicable, or that, at least, it should not be suffered to become much exhausted. The greater part of his experiments were conducted with a bath containing five milligrams of gold in a cubic centimeter of the solution. This corresponds very nearly with the proportions of half a grain to one troy ounce. From some statements given by him, it would appear that the cost of gilding a teaspoon by this method will not exceed 7 or 8 cents, exclusive of labor.

Steam Fire-Engine.—We hope to be able in the next number of the journal to give a report from the Committee on Arts and Sciences of the Mechanics' Institute upon this important subject. That Committee, after a long investigation of the several plans presented for competition, is about drawing its labors to a close, and will probably make a decision early in the present month.

Daguerreotype.—This art keeps pace in improvement with its twin-sister Electrotype. Professors Draper and Morse, and Mr. Wolcott, of this city, are obtaining by their experiments the most gratifying results. The last named gentleman has, within a few days, much increased the excellence of his pictures, by a new arrangement of his lights and apparatus. We may venture to promise that he will ere long publish some important facts relating to the speculum.

NEW WORKS.

Life and Adventures of Mungo Park. Being No. CV Family Library; by Harper & Brothers, New-York.—This is a concise and cheap edition of the life of this celebrated traveler, illustrated with appropriate wood cuts.

Natural History of Quadrupeds. Being No. CIV of Harpers' Family Library: Published by Harper & Brothers, N. York.—This, like their late work on Geology, is a cheap and useful work. It is chiefly compiled from the publications of the Society for the Diffusion of Useful Knowledge, and is illustrated with numerous wood cuts.

Correction.—In the article upon British and American Marine Engines, published in the last number, an error occurs relative to the Rochester, in the statement of the vacuum and the pressure of steam maintained within the boiler, which we deem necessary to correct, although it does not affect the final result of the calculations. It affords an opportunity, moreover, of accounting for what would be thought by those who know her working, a low estimate of the Rochester's power.

Instead of the pressure being 45 lbs. and the vacuum 11 lbs. they should have been placed at 40 lbs. and 9 lbs. The former quantities were made the basis of a calculation that showed the advantage of the Rochester's engine in stronger contrast to British engines. This was not adopted, however, from a belief that it would be better to take the *lowest* working of her engine to make the calculation from, which was done. Unfortunately, in the haste of preparing the article for publication, the pressure and vacuum of one calculation were taken for those of the other; and thus arose the error. MIRON.

PROGRESS OF THE MECHANIC ARTS.

Manufactures of Horn and Tortoise-Shell. By ARTHUR AIKIN, *Esq. late Secretary of the Society of Arts. Abridged from Transactions of the Society for* 1839, *Part II.*

HORN.

Almost the only kinds of horn that are the subject of manufacture are those of the bull and cow, and the hoofs of these animals; the horns of the bullock being thin, and of a very coarse texture, are used only for the most ordinary purposes. Our domestic supply is by no means equal to the demand, so that great quantities are imported from Russia, the Cape of Good Hope, and South America.

The first process is the separation of the true horn from the bony core on which it is formed: for this purpose the entire horns are macerated in water for a month or six weeks, according to the temperature; during this time the membrane which lies between the core and the horn is destroyed by putrefaction, so that the core becomes loose, and can easily be extracted. The cores are not thrown away, but are burnt to ashes, and in this state form the best material for those small tests or cupels employed by the assayers of gold and silver.

The next process is to cut off with a saw the tip of the horn, that is, the whole of its solid part, which is used by the cutlers for knife-handles, is turned into buttons, and is applied to sundry other purposes. The remainder of the horn is left entire or is sawn across into lengths, according to the use to which it is destined. Next, it is immersed in boiling water for half an hour, by which it is softened; and while hot, is held in the flame of a coal or wood fire, taking care to bring the inside as well as the outside of the horn, if from an old animal, in contact with the blaze. It is kept here till it acquires the temperature of melting lead or thereabouts, and, in consequence, becomes very soft. In this state it is slit lengthways by a strong-pointed knife, like a pruning-knife, and by means of two pairs of pincers applied one to each edge of the slit, the cylinder is opened nearly flat. These flats are now placed on their edges between alternate plates of iron, half an inch thick and eight inches square, previously heated and greased, in a strong horizontal iron trough, and are powerfully compressed by means of wedges driven in at the ends.

The degree of compression is regulated by the use to which the horn is to be afterwards applied; when it is intended for leaves of lanterns, the pressure is to be sufficiently strong (in the language of the workmen) to break the grain; by which is meant separating, in a slight degree, the laminæ of which it is composed, so as to allow a round-pointed knife to be introduced between them in order to effect a complete separation.

The plates thus obtained are laid one by one on a board covered with bull's hide, are fastened down by a wedge, and are then scraped with a draw-knife having a wire edge turned by means of a steel rubber; when reduced to a proper thickness and smoothed, they are polished by a woollen rag dipped in charcoal dust, adding a little water from time to time, then are rubbed with rotten stone, and finished with horn sha-

vings. The longest and thinnest of the films cut off by the draw-knife, when dyed and cut into various figures, are sold under the name of sensitive Chinese leaves, (being originally brought from China) which, after exposure to a damp air, will curl up as if they were alive when laid on a warm hand or before the fire.

For combs, the plates of horn should be pressed as little as possible, otherwise the teeth of the comb will split at the points. They are shaped chiefly by means of rasps and scrapers of various forms, after having been roughed out by a hatchet or saw: the teeth are cut by a double saw fixed in a back, the two blades being set to different depths, so that the first cuts the tooth only half way down, and is followed by the other which cuts to the full depth; the teeth are then finished and pointed by triangular rasps. If a comb or other article is too large to be made out of one plate of horn, two or more may be joined together by the dexterous application of a degree of heat sufficient to melt but not to decompose the horn, assisted by a due degree of pressure; and when well managed, the place of juncture cannot be perceived. The Chinese are remarkably skilful in this kind of work, as may be seen in the large globular lantern in the Museum at the East India House, about four feet diameter, composed entirely of small plates of colored and painted horn. Horn combs are made in London, in York, and in many other English towns, but the chief manufactory of them is at Kenilworth, in Warwickshire.

If a work in horn, such as one of the large combs worn by women, is required to be of a curved or wavy figure, it is finished flat, and is then put into boiling water till it becomes soft, and is immediately transferred to a die of hard wood, in which it is cautiously pressed, and remains there till cold.*

Horn combs ornamented with open work are not made in this country, because the expense of cutting them would be more than the price of the article would repay; but great numbers of them are imported from France. These, however, are not cut, but pressed in steel dies made in London for the French manufacturers; and from an examination of these combs, it is evident that the material must have been in a soft state, approaching to fusion, when put into the die. On referring to French authorities, I find it stated that horn steeped for a week in a liquor, the active ingredient of which is a caustic fixed alkali becomes so soft that it may easily be moulded into any required shape. Horn shavings subjected to the same process become semi-gelatinous, and may be pressed in a mould into the form of snuff boxes and other articles. Horn, however, so treated becomes hard and very brittle, probably in consequence of its laminated texture being obliterated by the joint action of the alkali and strong pressure.

Drinking cups of horn are thus made. The horn being sawn to the required length is scalded and roasted over the fire, as already described; but instead of being slit and opened, is placed while hot in a conical mould of wood; a corresponding plug of wood is then driven

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* Combs among the Romans were made of box-wood:

Quid faciet nullos hic inventura Capillos
Multifido *Buxus* quæ tibi dente datur.—MART. *Epig.* xiv. 25.

hard in to bring the horn to shape. Here it remains till cold, and is then taken out and fixed by the large end on the mandril of a lathe, where it is turned and polished both inside and outside, and a groove, or chine as the coopers call it, is cut by a gage-tool within the small end for receiving the bottom. The horn is then taken off the lathe and laid before the fire, where it expands and becomes somewhat flexible; a round flat piece of horn, of the proper size (cut out of a plate by means of a kind of crown-saw) is dropped in, and forced down till it reaches the chine, and becomes perfectly fixed in this situation and water-tight by the subsequent contraction of the horn as it cools. Capt. Bagnold informs me that he has seen in South America a nest of such cups turned to a thickness not exceeding that of a card, and accurately fitting into each other, the outer one holding about a pint, and the inner one little more than an ounce.

Horn is easily dyed by boiling it in infusions of various coloring ingredients, as we see in the horn lanterns made in China. In Europe it is chiefly colored of a rich red brown to imitate tortoise shell, for combs and inlaid work. The usual mode of effecting this is to mix together pearlash, quicklime, and litharge, with a sufficient quantity of water and a little pounded dragon's blood, and boil them together for half an hour. The compound is then to be applied hot on the parts that are required to be colored, and is to remain on the surface till the color has struck; on those parts where a deeper tinge is required, the composition is to be applied a second time. For a blacker brown omit the dragon's blood. This process is nearly the same as that employed for giving a brown or black color to white hair, and depends on the combination of the sulphur, which is an essential ingredient in albumen, with the lead dissolved in the alkali, and thus introduced into the substance of the horn.

In very early times bows were made of horn. Homer describes the bow of Pandarus (*Il.* iv.) as made of the two horns of a wild goat united base to base, reduced into proper form and polished, and then tipped with gold. The bow of Ulysses was also of the same material. (*Odyss.* xxi.) The long bow of the English archers was, I believe, entirely of wood; but in the East, even at the present day, bows are made entirely, or in part of horn. To the kindness of Colonel Taylor I am indebted for the opportunity of exhibiting to you a Chinese bow, made partly of wood and partly of buffalo's horn. The same gentleman likewise informs me that he has bought in Calcutta pretty good bows made entirely of buffalo's horn; but the best Indian bows, those namely of Lahore, are made of horn combined with wood, and strapped round with sinew. Horn lanterns were also used by the ancients, for we find one mentioned in the *Amphitryo* of Plautus, and in an epigram of Martial. Pliny also speaks of horn lanterns, and says that various other ornamental articles were made of dyed and painted horn.

Horn was also used as we now employ glass in windows, for which, however, it is not very well adapted, as plates thin enough to be transparent would soon warp, and be corroded by exposure to the weather.

Horns are also of very ancient use as musical instruments: the true bugle-horn was made of the horn of the urus, or wild bull, tipped with silver, and slung in a chain of the same material.

Another use to which horn has been applied is as a material for defence. I remember to have seen, several years ago, a complete suit of scale armor made of horn. It was said to have come from Arabia, and seemed very capable of turning the edge of a sword or a pistol bullet.

TORTOISE SHELL.

The general mode of manufacturing tortoise shell is the same as I have already described when treating of horn. It is softened by boiling in water, but mere water takes away much of the color: an addition of common salt prevents this injury; but if too strong a brine is used the shell will be very brittle. Two or more pieces of tortoise shell may be joined by laying their scraped or thinned edges together, and then pressing the joint between hot irons. If, however, the heat is too great, the colors are much deepened so as to become almost black, as is the case with moulded snuff boxes; for tortoise shell being less fusible than horn, cannot be made soft enough to be moulded without some injury to the color. Accordingly the manufacturers, at least in England, never attempt to produce tortoise shell combs with ornamental open work by means of dies, but in the following manner.

A paper being pasted over the tortoise shell, the pattern is drawn on the paper, and is then cut out by means of drills and fine saws: the paper is then removed by steeping in water, and the surface of the pattern is finished by the graver.

In making small side combs it is found worth while, in order to save a costly material, to employ a machine consisting of a cutter working straight up and down, and of a bed (on which the shell is laid) to which is given a motion advancing by alternate inclination, first to one side and then to the other. By this means the teeth of two combs are cut at the same time, those of the one occupying the intervals of the other. Such combs are called *parted*, the saw not being used upon them, and are often made of fine stained horn instead of tortoise shell. Tortoise shell is also used for inlaying tables, cabinets, and other ornamental articles, a metallic foil being placed below it to give lustre and color. This employment of it appears to be coming at present considerably into fashion.

Among the Romans of the Augustan age, this taste was not so much a fashion as a fury. The frames of the couches on which they reclined at table were covered with the largest and most beautiful plates that could be procured of tortoise shell, and it was employed for various other similar purposes; but I am not aware that it was ever used by them as a material for combs. It was brought by Indian and Arabian traders from the islands in the Indian Sea to Adulis, in Abyssinia, together with ivory, rhinoceroses' horns and hippopotamuses' hides. Here it was purchased by Egyptian merchants, was transmitted to Alexandria, and thence passed to Rome and the other great cities of the empire. For modern uses, thick tortoise shell is more valuable in proportion than thin, but among the Romans, where it was used only for inlaying, veneers were cut out of it. This art was the invention of one Corvilius Pollio, a man, as Pliny says, of singular sagacity in all things that ministered to prodigal luxury.

Mr. Adcock's new method of raising water ; in a letter addressed to the Editor of the London Mechanic's Magazine, by WILLIAM JONES *of Manchester.*

At the last quarterly meeting of the Manchester Geological Society, Mr. Adcock, C. E. read a most interesting paper on his patented invention for the raising of water from mines, and illustrated his subject by numerous diagrams, which excited much attention.

This invention is wholly unlike every thing that has preceded it; and should it answer as well in practice as in the experiments already made, it must be regarded as one of the most important inventions of the day. It can be put down, even in the deepest pits, at comparatively little cost; for there are *no pumps, no clacks, no valves, not even a pump rod* but simply one pipe extending to the bottom of the mine, and another pipe united to it, extending from the bottom to the top. These pipes are made of thin sheets of zinc or copper—wear and tear, comparatively speaking, nothing.

We will, however, let Mr. Adcock describe his invention nearly in his own words.

He stated that, encouraged by some former attempts to improve pump-work, by which he had been enabled to make one valve to do the work of four clacks, he was emboldened to attempt still further improvements, and eventually proposed to himself this question: Is it possible, in the raising of water from mines, to do without clacks or valves altogether? He knew this could not be done if the water were to be raised in a compact form, as in pump-work. For, in a pit 1,000 feet deep, the column of water being also 1,000 feet, the pressure against the sides of the pipe, towards the bottom, would be 440 pounds to the square inch, which no ordinary pipe could resist. Mr. Adcock next considered whether it might not be possible to bring up the water in a finely divided state, and he found that if the water were so brought up, it must be in the state of vapor or of rain. This chain of reasoning led him to investigate the descending velocities of drops of rain, when he found that by the laws of gravitation they ought to descend with a constantly accelerating speed; so that if the cloud were high from which they proceeded, they would fall so violently as to inflict injuries of a serious nature upon animal and vegetable life. This however, was prevented by the resistance of the air. Each drop of rain, while in the cloud, may be considered as in a state of quiescence. It begins to descend from a state of rest, with a motion constantly accelerating, and so continues until it acquires a certain amount of speed, from which time the rate of its descent is uniform. Mr. Adcock then proceeded to investigate the greatest descending velocities of drops of rain, and he found that, under ordinary circumstances they do not exceed from 8 to 12 feet in a second. From this it seemed to follow, that if water be in globules of a certain size and weight, like drops of rain, it cannot, under ordinary circumstances, descend with a greater speed than 12 feet a second. It is certain, that if these drops were kept in a quiescent state, and a current of air were made to move upwards, at a greater speed than 12 feet a second, they would flow upwards instead of downwards,

no matter what the height might be. And this Mr. Adcock has found by actual experiment to be the fact. He therefore does not raise water in a solid mass, as in a pump, but in a divided state like rain. In fact it is nothing more nor less than a machine for raining upwards! His apparatus consists of a fan like a common blowing machine which has given to it the required velocity, from any suitable prime mover. Also two pipes, as before stated; one to convey the air from the fan to the bottom of the mine, and the other to bring the air back to the surface, together with the water that accompanies it. With a 20 inch fan, 6 in. wide, he has driven up 63 gallons of water per minute, to a height of 40 feet, and with a 3-feet fan, 1 foot wide, erected at the works of Messrs. Milne and Co. at Shaw, near this town, he has driven up 130 gallons of water per minute, 120 feet in height.

Mr. Adcock's experiments having been witnessed by a large body of experienced and scientific men, they have subscribed a certain sum each, that this important discovery should be at once fully tested; and the necessary machinery will speedily be put down at the Pemberton Colliery, near Wigan. The depth of the pit is 100 yards, and from that depth it is expected that they will be able to raise 300 gallons of water per minute. The fan will be 6 feet in diameter, and 18 inches wide. I shall anxiously watch the progress of this invention, and will not fail to forward any information worth putting to paper, regarding this novel method of draining.

It is always to me exremely gratifying to find scientific men who have been working as it were in opposite directions, arriving at the same conclusions.

Mr. Adcock remarks that, after the drops of rain in their descent acquire a certain velocity, their motion is uniform. Now this exactly coincides with Dr. Lardner's opinion with regard to the descent of railway carriages upon steep inclines. On several inclined planes he found that whether the carriage descended from a state of rest, or was projected over the summit level at 40 miles per hour, by an engine in the rear, the train invariably reached the bottom of the incline at the same velocity. Joining these two ideas together, it has suggested to my mind a very easy method of measuring the velocity of a current of air or any other fluid. Let the pipe conveying the air, &c. have a semicircular bend, and let a small heavy ball be put into it; this ball will ascend and descend in the curve in exact acccordance with the velocity of the current.

New Railway Locomotive; invented and constructed by Mr. WALTER HANCOCK, *of Stratford, Essex, and now on trial on the Eastern Counties' Railway.*

One of the principal advantages of this locomotive is presented in the boiler, by which steam of greater power is generated with far greater certainty of continued supply, and more perfect safety, than by the boilers now in use, either in railway, marine, or stationary engines. This boiler is constructed of a number of distinct chambers, each chamber composed of several tubes. Each chamber, or rank of tubes, con-

nects with two general cylinders or reservoirs—one at the bottom for the supply of water, and the other at the top for the reception and passage of steam. The communications from each chamber to the water, steam pipes or reservoirs, have self-acting valves. When any leakage occurs, from wear, rents, or other causes, to any one chamber, the valves belonging to it close, and are kept to their seats by the pressure of the water and steam contained in the neighboring sound chambers, and the boiler remains as effective as before, excepting that the surface of that one chamber, is thrown out of use, without stopping the engines, and perhaps it would not be observed by the engine driver until the end of the trip, when the pressure being reduced by withdrawing the fire, the valve would fall from its seat and point out the defective chamber by the discharge of water. In half an hour a new chamber could be attached in its stead. In the ordinary locomotive boiler, when any one of its tubes become defective, the whole is rendered inoperative by reason of the unchecked communication of all the parts with each other, and so it remains until the defective tube is repaired, replaced or plugged, which generally occupies three or four hours, and is attended besides with the inconvenience of stopping the train until another engine is procured from the next station.

By adopting the improved boiler no such delay would occur, and the expense both in fuel and wages, of keeping a number of engines with their fires up ready to meet such casualties, would be avoided, as well as the risk when a train stops out of time, of having another train brought in collision with it, and the lives of passengers and attendants endangered.

The great heating surface obtained in a comparatively small space, is likewise a recommendation to this boiler. It is intended to attach a reciprocating set of fire bars to it, by which a clean floor of bars can be introduced without lowering the fire. The small weight of this boiler in comparison to its generating power, is another material point in its favor, for it leaves room for giving sufficient strength to all other parts, without exceeding the present total weight of a locomotive.

Having given a general description of the power—the engines and machinery come next under consideration.

The engines of the present locomotives are placed horizontally, and are thereby very much confined and difficult of access, but in this one they are vertical, and therefore the whole of the machinery, pumps, &c. are open to view, can be readily oiled, and speedily detached for repairs; or any portion may be put right and secured whilst the engines are working.

The engines of this locomotive give motion to a separate crank shaft, and this communicates the progressive motion to the wheel axle by an endless chain, working over a pulley fixed on each, and which two pulleys may be either of equal or different diameters, so that advantage may be obtained either for speed or power whichever may be required. This arrangement not only allows the wheel axle to be straight instead of cranked, but it also possesses the advantages of a moderate accommodation or play, by which all sudden jerks or concussions of the machinery, &c. are avoided.

The friction is reduced to above one-half, from such large eccentri-

cities, crank-bearings, &c. not being required, in consequence of the weight of the machinery, boiler, &c. being on straight instead of cranked axles.

This arrangement allows the work to be immediately thrown out, so that the engines will work the injection pumps, and get up the fire without working the driving wheels. By running locomotives about to effect these purposes, much of unnecessary wear and tear is incurred, besides running on the rails in the way of trains, &c. The present locomotive need not stir from the spot until the train is attached—the clutch then thrown in, it immediately starts upon its trip.

Correspondent of the Railway Times.

Method of reducing sulphuret of copper at the Alten mines in Norway.

These mines are situated in 70° north latitude—within the the arctic circle. A few specimens of ore brought from that region in 1827, drew the attention of some English miners who after a further examination of the localities, obtained from the Norwegian government a grant of the tract for the purpose of being worked. A colony of miners who now number about 1000, are almost the only inhabitants of that inhospitable district.

The process of smelting, is a salutary combination of the English and German method, due regard being had to the admixture of the various kinds of ore, and is thus simply described. The yellow ores (from 5 to 8 per cent.) are calcined in kilns in the open air, forty to sixty tons at the time; a few faggots of wood are placed underneath the ore, which is piled up in a round heap; it is then lighted, and by the time the wood is consumed, the sulphur has ignited. To prevent the process going on too quickly, the heap is covered over with fine ore, more or less thickly spread, by which means the draught and combustion are regulated. Care is taken that the process does not proceed too rapidly, which it will if a too great and sudden draught is admitted; in this case there is danger of the ores running together, and forming a combination which it would be difficult hereafter to reduce, without loss of copper. In eight days sufficient sulphur is generally expelled. The calcined ores are then mixed with about one-third their weight of coke, and submitted to a blast furnace, in which from 4 to 5 tons of ore can be reduced in 24 hours. This description of furnace we consider preferable to the reverberatory, as the separation of the metal from the slag is more perfect, and does not depend, as in the latter furnace, so much on the attention and mechanical skill of the furnace-man. The regulus from this process is about 30 per cwt. It then undergoes a farther calcination, sometimes in small kilns, and at others in the regular calciner, for 24 hours. The calcined regulus is then smelted in the metal furnace, about 25 cwt. at a charge, and generally occupies better than 3 hours—thus six charges are reduced in the 24 hours. This smelting produces what is called by the miners "purple metal," and thence it is passed through the roaster, which brings it to black copper, which is refined and shipped to England in the shape of tough cake copper, and has already obtained a character to compete with the best English tough cake.

Mining Jour.

PROGRESS OF SCIENCE.

Geological Speculations.—Origin of Metals; in a letter addressed to the Editor of the London Mechanic's Magazine, by ANTHONY CARLISLE, *of Langham-Place.*

Some of your numerous liberal contributors may probably be interested in the following observations upon the fashionable speculations of geology—a system projected to trace and display the origin and vicissitudes of our mundane creation, from the fossil remains of animals and vegetables, buried beneath the surface, at various depths and under unknown circumstances. Many of these evidences appear to be objects for surmise and wonder, rather than facts for physiological induction; but if geological inquiries were more rationally directed, some practical results might be obtained. The mortuary remains of organized creatures supply the earthy *dèbris* which appear on the surface of the globe, and each climate and locality presents its peculiar and corresponding kind of *mould*, while the immediate substrata, and even the more settled beds of mineralized matter, often retain evidences of their descent from the surface by percolation, each particular earth, ore or metal finding out its like, as we see in pyritic nodules agglomerated in chalk hills. The universality of iron at or near the earth's surface, and the veins of metallic ores occupying cracks, or occasional vacuities at different depths, denote their subsidence from the surface; and occasional breaks in the stratification may be reasonably imputed to local earthquakes or volcanoes, while the larger displacements not assignable to gravitation may have happened from changes in the polar axis either progressive or sudden, or even to depend in some instances on new accessions from other planets. I cannot, however, regard our very limited explorations of the mere crust of the globe as likely to afford proofs of its antiquity, while the vast central mass (said to be *granite*,) remains unknown. This most curious and interesting internal carcase of the globe is supposed to consist of stone never exposed to attrition, and yet exactly compacted into one solid mass, effected by causes far above my comprehension; but because granite does not yield metals, and it seldom overlays marketable minerals, geologists have not bored into it to try to fathom its depth, although, if not the mother nucleus, it may be the second shell of the globe.

After this general notice, I may be indulged in some suggestions more applicable to human powers, by presenting a series of phenomena which may be hypothetically directed to discover the natural causes and the origin of metals; and if in one instance only I should indicate the creation of one metal in the great laboratory of nature, that may prove to be a clue to the others. Although we do not know with certainty the ultimate particles of matter, yet according to the sagacious views of Robert Hook, we may justly assume that they are spherical, and being variously combined as to juxta-position and numbers, they form the elementary crystals figured in his Micographia, and that the

several properties of each compound, result from those variable combinations—an hypothesis rather favoring the occult doctrines of alchymy and of transmutation, but supported by many physical evidences, especially those drawn from the chemical elaboratories of animals and vegetables, not yet practically applied to geology. We may, however, rationally inquire, through the means of living laboratories, into the the origin and sources of such mineral bodies as are within the reach of common observation. For example, the notoriety of iron and silex in vegetables, of lime in bones and shells, and the universality of iron ores at the surface of the earth, all of them intimately connected with organic formations, show, that if not caused by those living elaborations, they are the manifest natural instruments for collecting different elements in quantities far exceeding the several proportions to be found in the watery medium which brings them together. If, again, the earths, which in many cases resemble the ores of metals, are in any instances owing to the organic chemistry of living elaboratories, a new field for research will be opened in artificial chemistry of wide expanse, but still within the scope of practical geology when limited to the evidences of organic *dèbris*, and to their connection with immediate substrata.

Under the foregoing very general suggestions I now proceed to invite practical naturalists to explore the earth's surface, by examining the different localities of the present creation, and their several probable durations. Some very important facts are presented by the best known mountainous diluvia, the several ravines, levels, and beds of rivers, and the local habitants of plants or trees which have been accessories to peat, clay, silex, and coal; also the colored earths, such as clay, slate, &c. Assuming that all the permanent colors have been derived from the most dense of all the elementary substances, the metals, and hypothetically that vegetable colors have the same origin, they being, as in the example of iron, probably created in the living elaboratories of successions of vegetables, and transmitted by watery percolation to their congeries previously settled in earthy graves.

These crude sketches are submitted as "words for the wise," and hints to be worked out by practical men, aided by the vast collections already recorded by real geologists.

Improvement in Mr. Smee's Galvanic Battery; in a letter addressed to the Editor of the London Mechanics' Magazine, by JAMES H. PATERSON, *Paris.*

The very superior galvanic battery recently discovered by Mr. Smee, in which platina is precipitated upon silver, or copper plated with silver, suggested to me the trial of another metal in the place of the silver: but before I give an account of these experiments, permit me to state, that since the appearance of your Magazine containing the directions for making Mr. Smee's batteries, I have had one made and tested it. It consists of 24 silver plates, size, 7 by 10 inches, divided into six elements or pairs, and although finished but a few days since, I have kept it almost constantly in action, and its effect, as compared with the old batteries, far exceeds the most sanguine expectations I had formed of it. The expense of the plates was great, and recollecting, while

preparing them, that iron immersed in a solution of sulphate of copper, without any previous preparation, almost instantly becomes coated with that metal, the experiment was made with *iron* in nitro-muriate of platina. To my surprize a coating of platina formed on the iron almost immediately, and with much greater facility than on the silver plates. In consequence a battery has been made of 20 small iron plates platinized, of about 2 inches by 3 in size, and the result is a power every way equal to a battery of silver plates. The process is in both cases the same, excepting the washing the plates with nitric acid previous to platinizing; but the iron does not require one half the time to prepare it that is required by the silver.

Apart from the comparative cheapness of this battery, many other advantages may be mentioned. In using silver, it being susceptible of action from the mercury used in amalgamating the zinc plates, the electric action projects some particles from the zinc upon the silver plates, and from this cause their action and effect gradually diminish. Iron having less affinity for the mercury, than the zinc, is not attacked by it, and no perceptible diminution of its effect or action takes place for hours, and after repeated trials of some hours each, is found to be as good as at the first immersion. The acid used is the same as directed by Mr. Smee, viz.: 1 part sulphuric to 7 parts of water. No porous tubes, canvas or paper bags or sacks are required to preserve the platina.

I have now in progress a large battery of thirty iron plates to be divided into six elements or pairs, my object being quantity rather than intensity. I need not dwell upon the advantages this discovery offers in regard to its cheapness, its freedom from noxious gases, or its equal and constant action. I have only ventured this communication in the hope that others possessing greater experience, science and opportunity than myself, may make still further and more important discoveries.

I am convinced that the *iron battery*, from its many advantages is an important step towards the adaptation of electro-magnetism to useful mechanical, as well as chemical and scientific purposes.

Royal Irish Academy.—A communication was read, by George James Knox, Esq. and the Rev. Thomas Knox, entitled, "Justification of Mrs. Somerville's Experiments upon the magnetizing Power of the more refrangible solar Rays." See Phil. Trans. cxvi, 1826.

Professor Morichini of Rome was the first to observe that steel, when exposed to the violet rays of the solar spectrum, becomes magnetic. Similar experiments were tried by Mr. Christie in 1824; but the most accurate experiments upon this subject have been performed by Mrs. Somerville in 1825, who determined that not only violet, but indigo, blue and green, develope magnetism in the exposed end of a needle, while yellow, orange, and red produce no sensible effect. As many philosophers have failed in repeating these experiments, we were induced, in the course of the summer, to undertake the investigation of this subject, "which has so often disturbed science." Having procured several hundred needles, of different lengths and thicknesses,

and having ascertained that they were perfectly free from magnetism, we enveloped them in white paper, leaving one of their extreme ends uncovered. Taking advantage of a favorable day for trying experiments upon the chemical ray, (known by the few seconds required to blacken chloride of silver,) we placed the needles at right angles to the magnetic meridian, and exposed them for three hours, from eleven to to one, to the differently refrangible rays of the sun, under colored glasses. Those beneath the red, orange, and yellow, showed no trace of magnetism; while those beneath the blue, green, and violet, exhibited, the two first feeble, but the last strong traces of magnetism.

To determine how far the oxidating power of the violet ray is concerned in the phenomena, we exposed to the different colored lights needles whose extremities had been previously dipped in nitric acid, and found that they became magnetic (the exposed end having been made a north pole) in a much shorter time than the others, and that this effect was produced in a slight degree under the red (when exposed a sufficient length of time,) strongly under white glass; and so strong under violet glass, that the effect took place even when the needles were placed in such a position along the magnetic meridian, as would tend to produce, by the earth's influence, a south pole in the exposed extremity.

Conceiving that the inactive state produced in iron (as observed by Schœnbein) when plunged into nitric acid, sp. gr. 1·36, or by being made the positive pole of a battery, or by any other means, might throw some light upon the nature of the electrical change produced, experiments were instituted to this effect, which showed that no trace of magnetism could be thereby produced.

Further improvements in the voltaic process of multiplying works of art in metal; in a letter addressed to the editor of the London Mechanics' Magazine, by Thomas Spencer, *of Liverpool.*

I take this opportunity of laying before yourself and readers a brief detail of a still further improvement of my voltaic process of multplying works of art in metal. In my pamphlet, printed last September (*Athenæum*, No. 626,) I there stated I considered the process comparatively incomplete, unless we were able to apply it to the multplication of models in clay or wood, castings in plaster, wood engravings, &c. as the fact, that galvanic deposition always requires a metallic surface to act on, seemed to set bounds to its application. I then resorted to various expedients to surmount the difficulty,—among others that of gilding and bronzing the surfaces of such materials, and to a limited extent this was successful, but still troublesome and expensive, and, more than all, the sharpness and beauty of the original was necessarily injured. I have since attempted to metallize surfaces by the use of plumbago (suggested to me many months ago by Mr. Parry, of Manchester.) This last possesses the faults common to the others, and in most instances the deposition goes on partially.

I am happy, however, to inform you, I have now adopted a method which answers completely, obviating all these objections, and leaving

the surface of the material acted on, as sharp as it was previous to the operation.

Should I be desirous of obtaining a copper mould or cast from a piece of wood, plaster, or clay, or other non-metallic material, I proceed as follows: Suppose it to be an engraved wooden block, and I am desirous of metallizing it, in order that I may be able to deposit copper on its surface, the first operation is to take strong alcohol, in a covered glass vessel, and add to it a piece of phosphorus (a common phial corked will answer the purpose;) the vessel must now be placed in hot water for a few minutes, and occasionally shaken. By this means the alcohol will take up about 300th of its bulk of phosphorus, and we thus obtain an alcoholic solution of phosphorus. The next operation is to procure a *weak* solution of nitrate of silver, place it in a flat dish or a saucer; the engraved face of the block must now be dipped in ths solution, and let remain for a few seconds, to allow capillary action to draw it into the wood.

This operation being performed, a small portion of the alcoholic solution of phosphorus must now be poured in a capsule or watch-glass, and placed on a sand-bath, that it may be suffered to evaporate. The block must now be held with its surface over the vapor, and *an immediate* change takes place; the nitrate of silver becomes deoxidized, and gives place to a *metallic* phosphoret* of silver, which allows the voltaic deposit to go on with as much rapidity and certainty as the purest silver or copper. This example will hold good for most other materials.

The whole process may be performed in a few minutes, and with absolute certainty of success. The interior or exterior surface of a plaster or clay mould, or that of a statue, no matter what size, may be thus metallized with equal facility. For the process of vaporizing, and should the material to be acted on not be large, I prefer fastening it to the top of a bell glass receiver with a bit of pitch or cement, and thus placing it *over* the capsule on the sand bath; the phosphoric vapor is by this means equally diffused, and not dissipated. An ethereal solution of phosphorus also answers; and a solution of either of the chlorides of gold or platinum may be used. I am inclined to think this process independent of its uses in galvanic precipitation, may be applicable to other branches of art. I would recommend those desirous of testing its effects, to try a small and sharp plaster of Paris medallion: dip its *surface* in a weak solution of nitrate of silver and *take it out immediately*, fasten it to the interior of a glass tumbler, and at the same time have a little hot sand ready in a dish; lay the watch glass containing a few drops of the phosphoric solution on this; now place the mouth of the tumbler over all, and the medallion will be observed almost instantly to change color. The operation is now completed, and the substance so operated on, may be placed in the apparatus already described and treated in every respect as if it were solid metal.

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* Subsequent experiments incline me to think, that metallic silver is thrown down and phosphoric acid is formed.

MISCELLANEOUS.

Friction between Air and Water.—The friction between air and water often produces the most magnificent, and, sometimes, disastrous consequences; for it is owing to this cause only, that the ocean rises into mountain waves, before the force of which all the works of man are as nothing. It is true, that waves are often seen when the wind does not blow, or when it has ceased, because the ocean, when once set in motion, continues to roll after the cause has ceased to act. A boat rowed across a still lake forms waves which do not reach the shore until long after the line of the boat has been obliterated. Even the small motion given to a surface of water by the fall of a stone thrown into it will be perpetuated for many rods in circumference. This propensity in water to perpetuate any disturbance in the natural smoothness of its surface is the reason why the ocean rises into waves, mountains high, beyond the reach of the storms which first set in motion, and, perhaps, many days after the storm has ceased. Seamen often know, from the appearance of the ocean, that there has been a storm at a distance, though not a sheet of their own has been filled with a breeze for days or weeks. In rounding the Cape of Good Hope, it is said, that the swell of the sea is sometimes so great that each wave and each hollow is a mile across. During the continuance of the wind, and in places where the waves are owing to its friction alone, the effect may be counteracted by pouring oil on the water,* which, spreading, defends it from the contact of the air, and thus produces a calm. If this can be done at the windward side of a pond, where the waves begin, the whole surface it is said, will soon become as smooth as glass. It is said, also, that boats, having to reach the shore through a raging surf, have been preserved, in consequence of the sailors having thrown a barrel of oil on the water.

Comstock's Natural Philosophy.

Value of Printing.—In 1274, the price of a small bible, neatly translated, was 30*l*, a sum equal to at least 300*l* of our money: a good and clear printed bible may now be had for two or three shillings. It is related that the building of the two arches of London Bridge cost only 25*l*, which is 5*l* less than a copy of the bible sold for, many years afterwards. These facts afford a curious commentary on the changes and advantages produced by the extraordinary invention of printing, which has done so much to alter all the institutions of the world wherever the press has appeared.

Eng. paper.

Method of impregnating water with iron.—Place a few pieces of silver coin, alternating with pieces of sheet-iron, in water. It will soon acquire a chalybeate taste, and a yellowish hue, and in twenty-four hours flakes of oxide of iron will appear. Hence, if we replenish with water a vessel in which such pile is placed, after each draught we may have a competent substitute for a chalybeate spring.

Inventor's Advocate.

* Franklin first noticed this fact.

Uses of Tin.—The possession of tin in ancient times was most important; as, from the want of the powers applicable in modern days, iron was incapable of being wrought into steel, the only form in which it was fit for warlike instruments. Consequently a sword of bronze was more desirable than one of iron, and the ore of tin was therefore sought as being capable of reduction by simpler process than that of other metal, and as having the property of readily forming an alloy, particularly with copper. It was a curious philosophical observation, that, on making an analysis of some *celts* found in Europe, in comparison with some found in Mexico, the alloy was precisely the same. Dr. Buckland.

Astronomy.—The observatory which has lately been erected near St. Petersburgh, cannot fail to be an object of interest to the scientific world. This gigantic structure consists of three large towers, connected together by various ranges of lower buildings; and it covers altogether a space of 900 square feet. At the top of each of these towers, resting upon an iron frame, is a moveable turret, from 20 to 30 feet high. These turrets are so contrived that they can be turned round, by means of some very ingenious mechanism, in any direction, either from east to west, or from west to east, so as to follow the course of the stars. In the large central turret is an enormous telescope, made by Utzschneider and Frauenhauter, of Munich. This telescope turns upon a pedestal of granite; it is 14 inches in diameter, and its extreme length is 21 feet. In one of the side turrets, fixed also upon a pedestal of granite, is a superb heliometer, 7 inches in diameter, made by the same opticians. In the other turret, there will shortly be a *dialytical* telescope, also 7 inches in diameter. This is an instrument on a new principle, constructed by Ploosl, of Vienna. All the apartments on the ground floor are fitted up with astronomical instruments on an equally large and magnificent scale. Thus every facility will be afforded to the Russian astronomer for the contemplation of the heavenly bodies, and for enriching science by fresh discoveries and calculations; and we are happy to hear from the learned secretary of the Academy, that it is proposed to fit up the observatory at the Luxembourg in such a manner as shall leave France no reason to envy the superior advantages of other nations.

Progress of Railways.—The London and Blackwall Railway was opened on Saturday for the conveyance of passengers. The length of the line is three miles and a half, and the distance was traversed in less than a quarter of an hour. The carriages are moved by two stationary engines, of 120 horse power each, which are worked in shafts sunk into the earth to the right and left of the lines. A communication is kept up between the termini by means of an electric telegraph. The following description of the working of the engines and telegraphs is interesting:—

"To the engines fly-wheels, or as they are technically termed 'drums, are attached, each of which is of the ponderous weight of forty-three tons, and twenty-two feet in diameter. A 'tail rope' is fastened to the drums, which is wound and unwound at each end by the stationary engines, there being also two engines of seventy horse power, each, sunk

beneath the Blackwall terminus. As the train proceeds to the latter place the drums at the London terminus unwind the rope by which the carriages are to be drawn again to London; and to prevent the rope flying across the sheaves in which it runs too rapidly, and thus becoming entangled, in consequence of no weight being attached to it, an ingeniously contrived break is placed on the platform by the side of the railway, at which a man is employed to regulate the unwinding of the rope. The rope is not an endless one, similar to that employed at the Euston-square station of the Birmingham Railway, but is in two parts, namely, one for propelling carriages to Blackwall, and the other from that place. The 'drums' take 80 turns to every mile of the ropes, each of which is three miles and a half in length.

The electric telegraph is the next object of attraction, and it is enclosed in a neat mahogany case, which is, so far as it is seen, above the ground, and a small bell announces when the train is to be put in motion. The telegraph is the invention of Messrs. Cook and Wheatstone, and enables parties at each end of the railway to hold conversation with each other with the most perfect facility. At each intermediate station one of the telegraphs is placed, to enable the servants of the railway to communicate with the engineers at the termini, and it was stated that notice of any impediment or casualty might be given at an intermediate station to one of the termini, and from thence conveyed to the other end of the line, in the short space of three seconds."

Percussion Lock.—The sporting world is indebted for this invention to Dr. Forsyth, a quiet unobtrusive and respectable Scottish clergyman, who mingles with his clerical pursuits some researches in science.

It may be interesting to give a brief account which we had from an acquaintance of Dr. Forsyth of the origin and progress of his discovery. His attention was first directed to the subject, by hearing that the French, shortly after the commencement of the revolution in 1793, had attempted, although unsuccessfully, to substitute for gunpowder, which the want of saltpetre prevented them from making in sufficient quantity, a sort of powder made from the chloride of potash. Being engaged in chemical studies, he experimented on this substance, and found, as the French had done, that the powder made from it, could not be used. In the course of his investigation, however, he produced a powder which was not only easily ignited by percussion, but also readily kindled common gunpowder. Here was the principle of percussion; and forthwith he went diligently to work, to construct a lock in which the flint and steel should be dispensed with. This he accomplished, most ingeniously, in a variety of forms; and, in spring 1806, he was able to carry to London a fowling-piece, with a percussion-lock, acting on fulminating mercury, which performed tolerably well, and fully embodied the principle. After being seen by some friends and acquaintances, among whom was Lord Brougham, it was shown to Sir Joseph Banks and Lord Moira, then Master-General of the Ordnance, both of whom were highly pleased with it. Lord Moira sent for Mr. Forsyth, and urged him to conduct some experiments at the Tower. At first, he was rather unwilling; but Lord Moira obviated his objection, by writing personally to the Aberdeen Presbytery for leave of

absence, and ordering the overseer of the Tower to furnish workmen, prohibiting all persons whatever from interfering with what was going on.

Mr. Forsyth commenced his experiments, and, after several attempts, succeeded at last in constructing a gun-lock and compounding a priming powder which answered still better than the fulminating mercury, and satisfied Lord Moira of the applicability of the principle to muskets. He was next instructed to ascertain whether percussion could be applied to guns, and a three-pounder was sent him to experiment on. After a few trials he constructed his lock for large guns and the invention was considered complete. Aberdeen Herald.

New System of Inland Transport.—An experiment has just been made on the Forth and Clyde Canal, in Scotland, which seems likely to be followed by very important consequences, in a scientific as well as commercial view, and to affect seriously the relative value of property in canals and railways. It is well known, that there is a system of canal navigation practiced on some canals in Scotland, in which light iron vessels, capable of carrying from 60 to 100 passengers, are towed along by a couple of horses, at a rate of ten miles an hour; and this is effected by what is called riding on the wave. This new system of wave navigation, the theory of which has been fully explained in the reports of the meetings of the British Association, given annually in the *Athenæum*, has hitherto been limited in its use by the speed of horses, and been thrown back into comparative obscurity by the brilliant feats of the locomotive engine, whirling its ponderous burden along the iron railway with the speed of the winds. The experiment, however, to which we now allude, shows that the same mighty machine is capable of performing feats equally astonishing in water as in land-carriage. *A locomotive engine, running along the banks of the canal, drew a boat, loaded with* 60 *or* 70 *passengers at a rate of more than nineteen miles an hour!* and this speed was not exceeded, only because the engine is an old-fashioned coal-engine, whose maximum speed, without any load, does not exceed twenty miles an hour; so that there is every reason to infer that, with an engine of the usual construction employed on railways, thirty, forty, or fifty miles an hour will become as practicable on a canal as on a railway. Thus, the wave theory, which was formerly a beautiful speculation of science, becomes the basis of a new system of illustrations from the practical application of its principles. The experiments to which we refer, were performed in the presence of a number of men of science, and gentlemen interested in the improvement of canals and navigation, under the direction of Mr. Macneill.

The predictions of science never received more perfect accomplishment, or more beautiful illustration, than on this occasion. It is well known to those who have studied what has been written on this subject, that the wave of the Forth and Clyde Canal, from its great depth, travels at the rate of about eleven or twelve miles an hour, and that, consequently in order to "ride on the wave," it would be necessary to draw the boat at fourteen or fifteen miles an hour—a speed hitherto impracticable, because above the available speed of horses; but it had been confidently predicted, that at these high velocities, the violent sur-

ges usual at velocities of eight or nine miles an hour would wholly disappear, and the vessel ride the summit of a smooth undulating wave, exciting comparatively little commotion in the waters of the canal. Two of the experiments performed set this truth in a remarkable light—Experiment, No. 3, being performed with an ill-shaped passage boat, which the engine had not power to drag "over the wave," and Experiment No. 1, with a boat suited to higher velocities. Now, it happened as predicted, the boat that moved at a less velocity than that of the wave, raised a high and powerful wave at the bow, which overspread the banks of the canal, and threw up behind it a foaming and most injurious surge; while, on the other hand, the vessel which moved at a higher velocity rode smoothly and even on the top of the placid and gentle wave, leaving behind it no commotion but the sudden collapse of the parted waters. These experiments are as follows:

Experiment I.—A passage-boat filled with passengers, drawn by the Locomotive Engine, passed over

110	yards in	12.4	seconds.
220	"	" 24.5	"
330	"	" 36.9	"
440	"	" 49.2	"
550	"	" 61.8	"

Being a velocity of above 19 miles an hour, *riding the wave,* with very slight commotion of the water.

Experiment III.—A passage-boat, containing passengers and baggage, but unsuited to high velocities, drawn by the Locomotive Engine, passed over

110	yards in	34.2	seconds.
220	"	" 65.0	"
330	"	" 96.2	"
440	"	" 127.8	"
550	"	" 158.8	"
660	"	" 190·8	"
770	"	" 221.8	"

Being a velocity of about 7 miles an hour only, with a large wave raised up at the bow and rolling over the bank, and an after surge tearing along, the boat being *behind the wave.*

Besides these experiments, there were others highly interesting in a practical view. A large fleet, consisting of three schooners, three sloops, two canal traders, and one small boat, forming a gross weight of about 800 tons, were dragged along the canal simultaneously, with no other force than the simple adhesion of the wheel of the rail. In another experiment, a train of five boats, capable of carrying 400 to 500 passengers, was taken along at the rate of fifteen miles an hour.

The results of the day's experiments appear to us most promising; phenomena in the motion of fluids, and of vessels on the water, hitherto unheard of, will be called forth.

Improvement of Locomotives.—Some calculations and experiments have been made by MM. Flachat and Petiet on the locomotives employed at the St. Germain and Versailles Railway, the result of which is that an advantage in the consumption of the coke from 25 to 30, and a notable increase of power, would be the result, by opening the valves for the escape of the vapor from the cylinder when the piston had run only 95 of its course, and by so constructing the slides that the vapor should be permitted to act on the 85th part only of the course of the piston. They are also occupied with the dimensions of the escape-tube in the chimney, by whose aspirations the fire-draught is kept up. Their calculations and experiments, they affirm, go to show that it is owing to

the resistance occasioned by this tube that all the efforts to increase the velocity of engines by an increase in the heating surface and vaporizing powers of the engines have hitherto failed. Our engineers, we expect, will not be very ready to subscribe to some of these results, which are directly opposite to the notions usually entertained about the lead and blast-pipe. Railway Magazine.

Dye-Wood.—A method of extricating the coloring matter from wood has been lately employed by M. Besseyre with much success. He first reduces the woods to very small divisions, and then immediately places them in a closed vessel exposed to a current of steam. When the whole has attained 80° of heat, it is uncovered, and watered with several pints of cold water. By means of a tap below, the condensed liquid is drawn off, and thrown back upon the chips; and this operation is repeated until the dye has acquired sufficient strength: it is then subjected to evaporation over an open fire, and subsequently in a sand-bath, and the extract becomes a mass, which is soluble in warm water.

Weather Effects—Electricity.—Very little of a decisive character has been elucidated with respect to the effects of a positive or negative charge; yet it is stated that a negative charge, connected for about half an hour with a person, causes an unequivocal perception of languor and oppression. There is an obvious parallel to this, in the powerful oppression, and sometimes distressing influence, of which highly sensitive individuals are conscious, on the approach of a thunder-storm, or during the prevalence of a north-east wind. The latter is characterized as peculiarly unhealthy, and productive of a sensation of dryness and cold, unaccompanied by a corresponding depression of the thermometer, because the north-east and east winds are often considered to be in a state of negative electricity. Veterinarian.

Black the worst Color for painting Wood Work in the open air.—There is nothing that will prove this evil more than by observing the black streaks of a ship after being in a tropical climate for any length of time. It will be found that the wood round the fastenings is in a state of decay, while the white work is as sound as ever; the planks that are painted black will be found split in all directions, while the frequent necessity of caulking a ship in that situation likewise adds to the common destruction; and I am fully persuaded that a piece of wood painted white will be preserved from perishing as long again, if exposed to the weather, as a similar piece painted black, especially in a tropical climate. I have heard many men of considerable experience say, that black is good for nothing on wood, as it possesses no *body* to exclude the weather. This is indeed partly the case; but a far greater evil than this attends the use of black paint, which ought entirely to exclude its use on any work out of doors, viz. its property of absorbing heat. A black unpolished surface is the greatest absorber and radiator of heat known; while a white surface, on the other hand, is a bad absorber and radiator of the same; consequently, black paint is less preservative of wood than white. Wood having a black surface will imbibe considerably more heat in the same temperature of climate than if that

surface were white; from which circumstance we may easily conclude that the pores of wood of any nature will have a tendency to expand and rend in all directions, when exposed under such circumstances; the water of course being admitted, causes a gradual and progressive decay, which must be imperceptibly increasing from every change of weather. The remedy to so great an evil is particularly simple, viz. by using white instead of black paint, which not only forms a better surface, but is a preventive to the action of heat, and is more impervious to the moisture. The saving of expense would also be immense; and I am convinced that men of practical experience will bear me out in my assertion. Trans. Society of Arts.

Vegetable Physiology.—The properties of plants, abstractly considered, are singularly analogous to those of animals. They have circulation, respiration, absorbent and respiratory vessels; they generate vital heat, have an evident degree of spontaneous motion, and, according to some physiologists, possess sensation. M. Dutruchet has devoted much time and pains to the observation of some of the most remarkable phenomena in plants. According to his system, tho seat of vital heat in vegetables is in the parts which are green; and this heat is periodically at its greatest degree at some particular period in the 24 hours; which period varies in different vegetables from 10 A. M. to 3 o'clock P. M. Some plants, like the rose, quickly give out their heat and their perfume; their heat is greatest at 10 o'clock: others wait till the sun in its zenith has most power; such as the borradge, to which the property of communicating heat has, for this reason, been ascribed from time immemorial, by good old village ladies. There are others, again, which, like the asparagus, have not their greatest degree of heat before 3 o'clock. Were it less difficult to ascertain the exact variation of temperature and of time, it would not be impossible, with a certain number of choice plants, to form a sort of *thermo-vegetable* clock, as a companion to the brilliant clock of Flora described by Linnæus. Unfortunately, the vital heat in plants is of a very slight nature, and is soon absorbed by the vapor arising from the sap, and by the formation of gas from oxygen during the day, and from oxide of carbon during the night. Nevertheless, it is capable of proof that vital heat exists in plants, and that it alternately increases and diminishes at stated intervals.

Kollman's New Patent Pianoforte.—This instrument is constructed on an entirely new principle from any which have hitherto been manufactured. The hammers and mechanism are placed *above* the *strings*, so that the hammers *strike down* on the strings, *towards* the bridge and sound-board. It is by this mode of action alone, that tone of the *finest quality* and *greatest power* is produced. In all other grand and square pianofortes, the mechanism is placed *under* the strings, and the hammers strike them *upwards*, *away* from the bridge and sound-board: this mode is in variance with true acoustic principles, for, were the bow of a violin introduced between the strings and the body of the instrument, tone of a very inferior quality would be the result. The entire plan of tuning is new, and rendered a mathematical operation, regulated with *ease* and *certainty*, by means of *screw power;* the pianoforte consequently stands

much longer in tune than any hitherto manufactured. The mechanism is *simple*, and acts with the least possible friction and resistance; consequently there is considerably less liability of the action becoming impaired by use. It affords the utmost scope to a facile execution, and combines with improvement in *quality* and *quantity* of tone, a *freer* and unfailing touch, enabling the performer to produce every shade of expression. In external appearance, these pianofortes are magnificent: there is a beauty of outline, in union with a solidity of strength, which will recommend them at first sight. From the triumphant success which has attended the trials of these instruments, in a series of concerts lately given at the Hanover square and Willis's Rooms, London, together with the immense superiority which was acknowledged to exist between Mr. Kollman's pianoforte and that of a first-rate maker, when contrasted at a late meeting of the Melodists' Club, there cannot exist a doubt but the musical public at large will not be long in extending their patronage to this very valuable invention.

Extraordinary Quarrying Operation.—One of the most gigantic operations in stone-quarrying ever undertaken in this country, occurred yesterday at the Killiney granite quarries. During the previous progress of the works, a huge wall or mass of granite had, from its peculiar hardness, been left standing between the two excavations on the hill-side. This mass, which was upwards of 70 feet in height, and of variable thickness, it was decided to remove by a single operation. For this purpose, two enormous drifts or holes were pierced at its base, from 15 to 20 feet in depth, and 5½ inches in diameter. These apertures were charged with about two hundred pounds of gunpowder: upon its explosion it produced a terrific disruption of the rock, which crumbled as it fell from its great height, raising a whirlwind upon its progress downwards. Thousands of people were drawn to the spot: at every point from whence a view might be had, groups were to be seen posted, anxiously looking for the miniature earthquake which was expected. The majority of the spectators kept a respectful distance; but many ventured so far as to stand at the telegraph, over the place where the drifts were bored. There were no stones driven upwards: it seemed as if the mass was moved up a little, and then pushed violently outwards towards the quarry. The effect was truly magnificent. Dublin Mail.

Comparative safety of Steam and other Vessels.—A pamphlet has recently been published on steam navigation, the design of which is both to remove the popular impression against conveyance by steam, as attended with more danger than that encountered by sailing vessels, and also to deprecate legislative interference with steam communication, and the suggestions as to the board for registering steam vessels by the Government commissioners.

The writer, to make his case stronger, makes use of the commissioners' report, which is hostile to the cause he advocates, and from the facts of which, nevertheless, he comes to a different conclusion than that drawn by the commissioners. The report gives, as the sum total of accidents from 1817 to 1839, both inclusive, 92: the number of steamers wrecked being 35, of collisions 12, of conflagrations 13, of boilers

bursting 22, and of cases of imminent peril 10. Now, wrecks and collisions are common to every vessel, whether moving by steam or not; and hence the writer, considering it would be unfair to consider these common accidents as throwing any light on the peculiar risks of steam, reduces the number to 22, which is the number of accidents arising from the bursting of boilers, the only accident of those above specified which belongs exclusively to steam navigation. By the total number of accidents 461 lives were lost; but these the writer reduces to 77, the number killed by boilers bursting.

He then proceeds to contrast these accidents with the losses sustained by the common merchant marine, and draws conclusions disadvantageous to the latter—gathering his materials from the report of a committee appointed in 1836 to inquire into the increased causes of shipwreck. This committee reported, that on the authority of the books at Lloyd's, 1114 vessels were stranded or wrecked, and 89 missing or lost, from 1816 to 1818; and 1573 stranded or wrecked, and 129 missing or lost, from 1833 to 1835. In the first of these periods, the number of vessels of which the entire crews were drowned was 49, and in the second 81; while in addition to these, the number of persons drowned in each period, of which the number belonging to each vessel was distinctly known, was 1700, and in the second 1714. The committee concluded with estimating the annual loss of British property at sea to be nearly £3,000,000, and the annual loss of life to be not less than 1000 persons.

By the side of this estimate the writer considers that the steam-vessel accidents vanish to nothing, and endeavors to prove that the difference does not merely arise from the great extent of the mercantile marine as compared with the steam vessels. He shows, that in 1835 the rate of loss of sailing vessels was 1 out of every 46, while the rate of accidents to steam vessels was 1 in every 72, while traffick was carried on in the latter to the extent of 5,432,000 tons.

Turning his attention to the alledged insecurity of the Thames, in consequence of the rapidity of the steam-boats in the Pool, the writer gathers from a list of accidents furnished by the Watermen's Company, that from May 1835 to December 1838, (three years and a half,) the number of personal accidents on the Thames was 120, of which 77 persons were saved from drowning, while the accidents to vessels were 72. Assuming from the accounts taken at the Government dock-yard at Deptford, that the number of steamers that pass weekly is 700, this gives 36,400 per annum, and 127,400 trips during the three years and a half. Now, as the total number of lives actually lost was 43, this gives no more than 1 life for every 3000 trips; and even if the whole 120 accidents be taken, it will be no more than 1 per 1000 trips.

Arguing from these premises that steamers are not only equally safe, but far safer than other vessels, the writer considers it would be inexpedient on the part of the legislature to appoint an inquisitorial board to interfere with steam alone, and shackle an invention which merits encouragement.

New species of Tissue and Tapestry.—An entire new species of tissue and tapestry has been invented or discovered by M. E. Pavy, and secured by patent, and which, as the material is produced in our own

colonies, promises to become an article of great commercial value. In particular, we would refer to some coverings of chairs and tapestry which have been especially ordered by her Majesty for the palace. It bears so strong a resemblance to silk of the best kind, that it is difficult without a minute examination to discover the difference. The material of which it is composed is the fibre of the banana, aloe, and other trees and plants which are plentifully found in our West India islands; and by very accurate experiments made by order of the French Government, they have been found on an average to exceed the strength of hemp by one-fourth. The experiments were made at Toulon, upon cordage which had been six months exposed. We understand that the French Minister of Marine has introduced ropes and cables made of this material into the Royal Navy; and as it is so much superior to hemp, we see no reason why it might not be advantageously employed in the cordage of the military and commercial navy of this country. Eng. paper.

Important Discovery.—A Bath paper says: "A patent has lately been granted by her Majesty to a gentleman residing near this city, for producing a beautiful and sparkling wine resembling the foreign champaigne, from the green stalk of the rhubarb plant grown in England. We understand the plant is very wholesome, and the quantity of wine to be made from it is immense, the *annual* produce of an acre of ground exceeding *one hundred and fifty hogsheads.*

French Import Duty on Steam-Engines.—The committee of the Chamber of Deputies, to which the new customs tariff has been referred for examination, have introduced some important changes in the Government bill. The latter proposed reducing to 10 per cent the import duty on steam-engines for international navigation, which is at present 30 per cent. The commissioners were of opinion to maintain the duty of 30 per cent on engines under 200 horse-power, in order to secure an efficacious protection to French mechanics, "who manufacture those engines as well as the English;" but, considering the superiority of the latter in the manufacture of engines of greater power, they resolved on freeing from all duty engines of 200 horse-power and upwards. The committee, moreover, establish a drawback on the raw materials in favor of engines constructed in France, which they propose to fix at 15 per cent, *ad valorem* of the engines, payable to the manufacturers, whether the engines remain in France, or are exported to foreign countries.

The Fine Arts.—The Italian sculptor, Marchesi, who is now in Vienna, has just completed a beautiful statue of Venus, for the Emperor Ferdinand. His majesty made a visit to Marchesi and appointed him sculptor to the Imperial Court. The Venus is the theme of admiration at the Belvidere. In addition to the very large sum of money which the Emperor paid for the statue, he presented to the artist a gold snuff-box ornamented with the Imperial cypher in diamonds.

The statue of Goethe, on which Marchesi has been for a long time engaged, is now finished and dispatched to its destination at Frankfort. The great German writer is represented seated; his head is raised as in a moment of poetic inspiration, and in his right hand he holds a style

with which he seems to be about to note down his thoughts on a scroll held in his left hand. This statue is alike remarkable for grandeur of conception in the design and for exquisite beauty in the execution of its most minute details. Polytech. Jour.

New Quicksilver Mine.—A very rich mine of quicksilver has recently been discovered near Serviglione, not far from Serravezza, in the grand duchy of Tuscany. About fifty years ago a mine of quicksilver was discovered at Salvanna, but was abandoned on account of the difficulties which were encountered in working it. No such difficulties exist with respect to the mine just discovered near Serviglione. Persons competent to form an opinion on the subject, declare that this recently discovered mine promises to be even more productive than the celebrated quicksilver mines at Almaden, in Spain Ibid.

Chromic Acid.—At a meeting of the Royal Scientific Society, at Copenhagen, Professor Jacobsen communicated the result of his experiments on chromic acid, especially in reference to its chemical and therapeutic properties, and their application in anatomical preparations. He moreover announced a discovery made by an apothecary named Wolff, *viz.*: that chromic acid when placed in contact with spirits of wine, produces combustion. Ibid.

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Improved mode of applying water-power, patented by Capt. George Davey.—The inventor claims the application of air-jackets or chambers to a column of water, and the method of applying the power obtained by the pressure of the said column of water, through the medium of the compressed air contained in the said air-jacket, whereby so great a quantity of air is driven into the working cylinder as to effect a great saving of water, which, in cases requiring a reservoir at a high level, is very important. An upright tube leads from the reservoir to the full extent of the fall of water; at each thirty feet this tube is surrounded by an air-jacket, and three or four fine holes are made at the bottom of the tube, within the space covered by it. The lower part of the tube has a lateral connection with a small cylinder, with a double piston or dead boxes working therein. At the opposite side of this cylinder, there is a lateral connection with the working cylinder, that moves, by its piston and rod, pump or engine. The water, passing from the reservoir, down the tube, forces a quantity of air from the air-jackets, with the water, through the small cylinder (that has its

double piston open) into the large working cylinder, by which means the piston of this cylinder is forced up; and the tappets on the rod of this piston are so arranged as to strike a lever connected with the rod of the double piston which admits and shuts off the supply of water from the tube to the working cylinder. The piston of this cylinder being now forced up, the tappet on the rod causes the lever to put the double piston in such a position as to cut off the supply of water, until the water that is below the large working cylinder flows out into the waste, or discharging level. The piston with the rod, in descending, by its gravity, causes another tappet to strike the lever, and put the double piston or dead boxes in the first position, in order to receive a fresh supply of compressed air and water, to set the piston in the large cylinder again in motion, which communicates its power to a pump or engine.

Painting on Lime, &c.—M. Heideloff, a professor at Nuremburgh, has succeeded, after many investigations and numerous experiments, in fixing paintings unalterably, and at little cost, upon lime, gypsum, and stone. The application of this process has been successfully tried in the cathedral at Bomberg. The process is extremely simple. The size, for binding the lime, is formed only of milk, and the preservation of the painting from heat, cold, and damp, is solely attributable to the method of preparing the mixture. This invention has also the additional advantage that the paintings done in this manner may be washed with water without losing any of the freshness of their colors. It may be added also, that lime receives the colors better than fresco. Inventor's Advocate.

Antediluvian Forest—Formation of Coal.—There has been discovered by the workmen employed in cutting out the new road leading to the Norham bridge, on the north side of the Tweed, a number of fossil trees. They appear to be of great antiquity, and do most beautifully illustrate the formation of coal from the remains of vegetable matter, being for the most part incrustated with that substance, and some of it being of the purest kind. The stones are all lying in a horizontal position, and from 10 to 20 feet from the surface. The roots of the trunks cannot be perfectly traced, but the evident appearance of the lamina and of the branches completely establish their character. The trunks vary in size, but the largest appear to be about five or six feet in diameter. Several gentlemen in the neighborhood have received specimens of what we have every reason to believe has been an antediluvian forest. A number of fossil trunks are yet *in situ*, and may be viewed by any naturalist desirous to see them Berwick Warder.

Nitrate of Soda as Manure.—This substance is, as its name implies, a compound of nitric acid and soda, and in many respects similar to common nitre (nitrate of potassa.) It has been chiefly procured from Hindostan, where it is found in extensive natural beds. In the spring it was sold at 18*s.* per cwt., but it has now reached 22*s.*, and even in some places, we believe a higher figure. It is sown by the hand, early in spring, at the rate of a hundred-weight to the acre; and as yet it has only been applied to grass lands, and in a few cases, to oats. Al-

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though in a crystalized state, the crystals are very small, and in color and appearance they very much resemble dirty herring salt. From its metallic base and large proportion of oxygen, the nitrate of soda weighs well to its bulk, and indeed a couple of hundred weight may be put in a common wheelbarrow. It has thus the advantage of being very portable. When sown upon grass lands its effects are said to be most rapid. Where tried the rest of the field has been either left untouched or manured with bones or lime, and within a few days the land which had received the quickening influences of the Eastern manure took a start in vegetation, which it has fairly kept ever since. Where bones are used in top-dressing, cattle cannot be induced for long after to touch the grass, but the application of nitrate of soda is said to have no such effect. The powerful acid which enters into its composition appears to be an effectual extirpator of grubs, snails and other ground insects, the source of much annoyance and loss to the farmer. Like other salts the nitrate of soda is a powerful agent in attracting moisture from the air, and the grass upon which it is sown has been observed to be "impearled with dew" when other fields were hard and dry. Probably this curious fact may have had no small influence in stimulating vegetation in such a season of drought as the present. These are the qualities ascribed to this manure, the most important of which is undoubtedly its power of producing food for stock early in spring. An extensive trial of it will be necessary before any proper judgment can be pronounced. It is as yet unknown whether its effects are lasting, and until this, of itself, is ascertained, caution must be used. It may be easily adulterated, but of course this will be detected by tests; a simple one will be to apply a red hot cinder to a small quantity, which, if pure, will give off oxygen so rapidly as to produce, almost instantaneously, a full combustion. Dumfries Courier.

New Planing Machine.—We lately had the pleasure of seeing in operation a new and very curious as well as effective machine for planing iron, invented and constructed by Mr. Rennoldson of South Shields. The advantage obtained in this machine over others which we have seen, is that it cuts over the whole of the surface of the metal at once, whether it be one inch or 12 inches in breadth, with great ease; by which process, a very great saving in time is, beyond doubt, effected. It is extremely difficult to convey a correct idea of the manner in which this is effected without the assistance of diagrams. We can state thus far, however: the principal feature in which it is superior to others, is in the chisels or cutters, which are firmly imbedded in an iron roller about fourteen inches in length, and about three and a half inches in diameter. There are eight chisels in the circumference of this roller which extends rather more than half the length. The other end is furnished with an equal number, which likewise extend over a little more than half the length of the roller, and also intersect the position of the cutters in the opposite end, dividing the power which would be required to work it, if the cutters were as long as the roller itself. It is decidedly superior to the point for which a patent has been obtained, as it is calculated to do three times as much work in a better style, in the same time. Inventor's Advocate.

New mode of propelling Steam Boats.—Falkirk, July 7.—An ingenious mechanic, residing at Grahamstone, has been for a long period engaged in constructing a small vessel to be propelled by means of pressure pumps—the application of a principle quite new to the masters of this science. On Monday evening the boat was launched into the Forth and Clyde canal, at Bainsford-bridge, and proceeded beautifully along the reach at the rate of not less than 15 miles per hour, conducted alone by the inventor, who worked the pumps. This novel invention has produced much speculation among the members of the profession in this place, and it is now reported that he is so much satisfied with his first experiment, that another on a larger scale is forthwith to be undertaken, and a patent procured to protect the invention. He has no doubt that it will, at no distant era, entirely supersede the present mode of propulsion by means of paddle wheels. Times

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Gougy's Patent Stop-Watch.—The improvement which constitutes the subject of this patent, is one of the most ingenious and useful contributions to horological mechanism, which has been made within our recollection. It enables us for the first time to determine with infinitesimal exactness by means of a common pocket watch—the improvement of course being applied to it—the precise instant of time, at which any particular occurrence takes place, such as an eclipse or occultation of any of the heavenly bodies—the transit of a racer past the winning post—or of a railway locomotive, going at four times the speed of the swiftest racer that ever graced the turf, past any given point of its course. The bearer of the watch has but to press with his finger, a small projecting knob on the outer case at the moment the moving object crosses his vision, and *the thing is done.* On referring to the dial-plate he sees the instant at which the event took place indicated by a supplementary second hand—previously concealed from view, in consequence of its being placed exactly under the ordinary second hand, and revolving with it, but now made (by the pressure on the outer knob) fixed and stationary, until the observation is written off, when by another pressure of the finger, this supplementary hand is made instantly to resume its original position, and to rotate with the other hand as before—the second wheel continuing all the while perfectly unaffected and undisturbed.

Steam Locomotion on Common Roads.—An experimental trip of Sir J. Anderson's steam-drag for common roads, took place yesterday on the Howth road, and fully answered the anticipations of all concerned. It ran for about two hours, backing and turning in every direction—the object being chiefly to try the various parts in detail. It repeatedly turned the corners of the avenues at the speed of about twelve miles an hour, and at a pressure of only about 46 or 48 pounds upon the square inch. No smoke whatever was emitted, and very little steam was observed, while even these, it is alledged, will be removed, when running publicly upon the roads. The whole machinery is ornamentally boxed in, which prevents the nervousness so often experienced in railway carriages, when the movements of the different parts are exposed to view; neither do horses show any alarm when it passes them.

The directors of the English company formed for the purpose of working out Sir James Anderson's patent, are about to assemble at Manchester in order to witness a trial of the carriages constructed there; and it is expected that the noblemen and gentlemen forming the company will afterwards come to Dublin; it being the intention of the patentees to form a company, in conjunction with that of England, for establishing communications by means of these drags, between the principal towns in Ireland, as soon as a few of the carriages now constructing, and in a forward state, are completed. It is proposed that the English company should, in the first instance, in conjunction with the railway trains from London, run from Birmingham to Holyhead; the passengers to be thence conveyed by steam vessels to Dublin twice a day; from Dublin to Galway by the steam-drags, and thence by steam vessels to New-York, touching at Halifax. Thus making Ireland the stepping-stone between England, Nova Scotia, and the United States, and avoiding the delay and danger of beating up the channel, the most arduous and annoying part of the present route. The whole distance between London and New-York will be accomplished, it is expected, in ten days. Dublin Paper.

On the autogenous uniting of Lead and other Metals; by M. DELBRUICK.—The term "autogenous" is employed by the inventor, M. de Richemont, of the method now described, to designate the union of pieces of metal of the same kind with one another, without the intervention of the ordinary alloys of tin or other connecting medium. This is effected by directing, by means of a fine beak, the flame of a jet of hydrogen on the parts to be united. A complete fusion of the metal is thus effected, and the parts are united in one homogeneous mass, the metal at the points of junction being in the same state chemically as at the parts untouched. Plates of any thickness, whatever the direction of the edges to be joined, may thus be perfectly united, and the lines of junction made as strong as the rest of the mass. Many circumstances contribute to render the joints made with common solder objectionable. The rates of expansion and contraction on changes of temperature for lead and its alloys with tin are different; some chemical agents act much more on alloys of lead and tin than on lead alone. The alloys also are fragile, and the solder may not perfectly attach itself, without the imperfection being observed. In addition to obviating these objections, M. de Richemont conceives that his new method or union possesses the farther advantages of economy, in saving of solder and in avoiding seams and overlappings; in permitting the use of thinner lead and the use of lead where it is now inadmissible, and in rendering practicable the repairs of vessels which are now impracticable.

M. de Richemont also applies this jet of flame to heating the common soldering irons used by tinmen and plumbers. The jet is permitted to play upon the tool, which, in a few seconds, is brought to the requisite heat, and maintained at that heat without any injury to the tool. The heat can be regulated to the greatest nicety by diminishing or increasing the jet. The author conceives that the sulphate of zinc produced in the manufacture of the gas will be found of such value as greatly to diminish the cost of this process.

Daguerreotype Engraving.—We have received from Dr. Mackenzie, still at Vienna, some further particulars of the interesting process by which Dr. Berres fixes and engraves the Daguerreotype pictures, and also two impressions from such engravings. These impressions are shadowy and very indistinct, but the design is sufficiently made out to justify the hope that further experiments and practice will render the discovery practically available. Respecting the process, Dr. Mackenzie observes, "The proportions are now fixed as follow:—Seven parts of acidum nitricum, of forty degrees of strength, to eight parts of distilled water. With gum arabic the operation is a little longer in being finished, but the picture is much handsomer; without gum it is quicker, but it requires much more care and attention to produce a good engraving. When it happens that the nitric acid produces a precipitate upon the silver plate, *ammonia* must be poured upon the plate, and it will instantly disappear. From time to time it is desirable to take the plate out of the acid and wave it about; thus drying it you perceive better the progress made in the engraving. When the acid becomes muddy it is necessary to change it." Athenæum.

Hint to Builders.—It was stated at a recent meeting of the Institute of British Architects, that the stone with which Henry VII's Chapel has been repaired, and on which 40,000*l.* has been expended, is already in a state of decay, and will in ten years be a ruin, owing to the softest quality of the Bath stone having been used for the purpose; and that the Banqueting House at Whitehall, having been repaired with Reigate stone, may expect the same fate. This at any rate is hard enough for those who have to pay for it, while it shows that we have soft people as well as soft stones among us. Argus.

The Archimedes steamer, on board which Captain Chappel, R. N., is embarked, to report upon her qualities to the Admirality, arrived here on Thursday from Southampton, having made the passage to the harbor's mouth with sails alone, going nine knots per hour. That day at noon, having taken on board Sir Edward Codrington, Naval Commander-in-Chief, Admiral Bouverie, second in command, Lord Dundonald, Sir Thomas Hastings, captain of the *Excellent*, Colonel Pasley, Royal Engineers, Captain Mitchell, R. N., of the *Magicienne*, Captain Basil Hall, R. N., and about twenty other naval officers, together with several scientific gentlemen from the Royal dockyard, she started with a fair wind for St. Helen's under sail, without any fires lighted. She afterwards luffed up, and made several tacks through Spithead, and finally, taking in all sails, lighted the fires, connected the screw, and steamed into harbor, beating both the Isle of Wight steamers, though they had steam and sails, and the *Archimedes* had steam only. As a *finale* she kept threading in and out among the line-of-battle ships, backing and turning in every direction. Sir E. Codrington, and the other leading persons, expressed their entire satisfaction at the result of this experimental trip. In order to make known her qualities as much as possible the *Archimedes* is to proceed to Plymouth, Bristol, Liverpool, Glasgow, and Dublin. Hampshire Telegraph.

Valuable Secret Lost.—Mr. Eaton, in his "Survey of the Turkish Empire," mentions the following circumstance as having come within his own knowledge:—"An Arabian of Constantinople, had discovered the secret of casting iron, which, when it came out of the mould was as malleable as hammered iron. Some of his fabrications were accidentally shown to M. de Gaffron, the Prussian chargè d'affaires, and M. Franzaroli (men of mineralogical science,) who were struck with the fact, immediately instuted an inquiry for its author. This man, whose art in Christendom would have insured him a splendid fortune, had died poor and unknown, and his secret had perished with him. His utensils were found, and several pieces of his casting, all perfectly malleable! M. Franzaroli analyzed them, and found that there was no admixture of any other metal. M. de Gaffron was afterwards made superintendent of the iron manufactory at Spandau, where he in vain attempted to discover the process of the Arabian.

The late Earl Stanhope.—I had the honor of knowing him for some years, and he frequently described to me his intended improvements in printing. One was to make the bottom of the boxes in the cases concave, so that the types should always be convenient for the compositor to pick up; another was to lay four different sized types in the same pair of cases; another to alter the curve at the top of the *f*, and discard its ligatures; another to cast certain logotypes. Some of these were not improvements in practice, and the others, except they had been generally adopted, would have destroyed uniformity in works that were printed in different houses, in addition to the great expense and inconvenience both to letter-founders and printers. In attempting too much, none of his plans were adopted, so far as related to composing.

Savage's Dictionary.

Rise of the Demidoffs.—The founder of this rich and powerful family was an experienced blacksmith of the name of "Demid Antuffy," whose son Nikita commended himself to the patronage of Peter the Great as a skilful member of the craft. For the first 300 halberds which he made according to a German model, Peter paid him three times as much as he asked; nay, he condescended to pay him a visit under his own roof; and a goblet of wine being presented to the monarch on this occasion, he is said to have observed with some degree of asperity, "What, smith, thou hast foreign liquors among thy stores! Let me have some brandy: that is not an expensive drink and agrees well with a Russian stomach!!" The immediate consequence, however, of this visit, was a grant of land for a manufactory of arms, with which iron works were to be united, in the neighborhood of Tula. This was the groundwork of the subsequent affluence of the family. Antaffjeff had already turned his avocation to so rich an account, that, upon the birth of the Grand Duke Peter Petrovitsh, he went to St. Petersburgh, and presented the court with avariety of articles of gold which he had extracted from the Siberian mines; and when the young Grand Duke cut his first tooth, he made him a present of 100,000 rubles. The imperial rescript which gave him rank as a nobleman, bears date on the 12th September, 1720, from which time Demidoff became the family name.

United Service Journal for June.

Wooden Percussion Plugs.—Captain Norton lately proved, in presence of a Select Committee of Artillery Officers at Woolwich, the efficiency of his wooden plugs for producing ignition with percussion powder, by inserting them in his percussion rifle-shells, 12 of which were fired at a target placed at 100, and 150 yards, and all exploded.

United Service Journal for June.

EXTRACTS FROM NEW WORKS.

We take the earliest opportunity to give from Dr. Lee's work upon geology, the promised information relating to some of the more important mineral productions of North America.

COAL.

The coal strata have been observed as far north on this continent as human discovery has yet penetrated. At Melville Island, in latitude 75°, where the summer lasts but a few weeks, Captain Parry found in the coal formation an abundance of impressions and casts of plants which bore a tropical aspect; and in Spitzbergen, which is still nearer the north pole, there is also an extensive coal deposite, with the same remains of fossil vegetables.

Nova Scotia affords bituminous coal of good quality; the quantity very great, if not inexhaustible.

Rhode Island has many localities which yield large quantities of coal. Those which have been explored are situated chiefly in Portsmouth, near the northern extremity of the state.

Massachusetts.—Anthracite coal has been discovered at Worcester; vein 7 feet thick; operations for the present suspended. Mansfield has extensive formations of anthracite; and small quantities of bituminous coal have been found in the new red sandstone near West Springfield.

Anthracite coal fields of Pennsylvania.—No part of the world can boast of such inexhaustible beds of anthracite as the state of Pennsylvania. To use the language of Prof. Rogers: "Embracing a territory where the upper coal-bearing rocks of the great ancient secondary basis of the continent terminate towards the east and north, the revolutions which have stripped other states of their treasures have left us in possession of some of the largest and most richly supplied coal fields of which any country can boast. When we regard their immense extent, comprising either the whole or a part of the area of 30 counties out of the 54 in the state, and the wide range and great thickness of many of the coal seams; and when we contemplate the amazing variety in the character of the mineral itself, showing every known gradation from cannel coal to anthracite, fitting it thus for every possible adaptation in the arts or as a fuel, and then turn our attention to the geological and topographical structure of the regions, affording a ready access to their most secluded districts, we behold such a prodigality of happy circum-

stances as may well inspire exultation. It is estimated that the anthracite coal conveyed to market from our mines in the course of the last year (1837) has nearly amounted to 900,000 tons; yet this large quantity sinks into insignificance when we look at what the coal trade even in the next ten years is destined to become. If we turn to the southern anthracite basin, the present seat of the most extensive mining operations in the state, we behold a mass of coal measuring nearly 60 miles in length and 2 in average breadth, having in the middle an aggregate thickness of good and available coal exceeding probably 100 feet! When we consider that from this basin and its branches above 730,000 tons have been sent to market in the course of the past year from six districts only, and when we reflect that nearly all this coal has been taken from the strata above the water-level, below which hundreds, nay, thousands of feet of coal, following the dip of the same, lie still untouched, we are made aware of the enormous amount of undeveloped resources in this coal region alone."

The bituminous coal fields of Pennsylvania.—Great and valuable as are the anthracite deposites of Pennsylvania, her bituminous coal region is still more extensive and inexhaustible. We have already stated that the great secondary deposite, which extends from the Hudson to the Mississippi, and probably to the Rocky Mountains, is in Pennsylvania limited by the Alleghany Mountains, which appear to form the barrier or dividing line between the anthracite and bituminous coal beds, or between the secondary and transition formations. The union or junction of these formations is distinctly marked in the end of the mountain where the west branch of the Susquehanna breaks through it, above Bald Eagle, the latter resting against the former, and forming the basin in which the bituminous coal, in regular and successive strata, is deposited.

This coal field, then, which is bounded on the south and east by the Alleghany Mountains, extends into Virginia and westward, so that bituminous coal abounds to a greater or less extent in all the western counties of Pennsylvania, with the exception of Erie, in which it has not been discovered. The counties of Bradford, Lycoming, Tioga, Potter, McKean, Warren, Crawford, Bedford, Huntingdon, and Centre, lie partly in and partly out of the coal field. The counties of Alleghany, Armstrong, Beaver, Butler, Cambria, Clearfield, Fayette, Greene, Indiana, Jefferson, Mercer, Somerset, Venango, Washington, and Westmoreland, are wholly within its range, and embrace together an area of 21,000 *square miles*, or 13,440,000 acres, while the anthracite coal districts have been computed to contain but 624,000 acres.*

Its great abundance and cheapness have indeed given birth to the vast and widely extended manufacturing establishments of the west. Without coal they could not exist. It thus constitutes the life-spring of western Pennsylvania, and the pedestal of her great manufacturing emporium, Pittsburgh. This city alone and its environs, in 1835, contained 120 steam-engines for the various manufactures of iron, steel, glass, cotton, salt, brass, white lead, flour, oil, leather, &c. These engines consume annually nearly 3,000,000 bushels of coal.

* Packer's Report to the Senate of Pennsylvania, March 4th, 1834.

The coal consumed for every purpose in and about Pittsburg has been estimated at 7,665,000 bushels, or 255,500 tons. At four cents a bushel, the price now paid in Pittsburg, it would amount to $306,512. Besides this, great quantities are shipped to Cincinnati, New Orleans, and the intermediate places, where it is sold for from five to ten dollars a ton. Large quantities of it are also consumed in the western counties of Pennsylvania in the manufacture of salt, as there are more than 100 salt manufacturing establishments in that region, and many others going into operation, which produce annually more than 1,000,000 bushels of salt, and consume 5,000,000 bushels of coal. The total amount of anthracite and bituminous coal at present derived from the coal beds of Pennsylvania cannot fall much short of 2,000,000* tons annually; being about one-twelfth as much as the total annual product of all the coal fields of Great Britain, nearly half as great as that of all the rest of Europe, and about equal to that of France.

Coal fields of Maryland.—These are bituminous, and, so far as discovered, two in number, viz. the Cumberland Field, extending from Will's Creek to the head branch of the Potomac, being about 60 miles in length by from 5 to 7 in width, covering an area of 400 sq. miles; the coal existing in beds of from three to fifteen feet thick, of an excellent quality, burning easily, with a bright and durable flame, caking, and leaving little residue. The other, called the Youghiogeny Field, lies west of the Alleghany Ridge, is of unknown extent, and has beds of coal 20 feet in thickness.

Virginia abounds in both anthracite and bituminous coals. It is a remarkable fact, that nearly all the coal beds of this country, like those of England, are associated with iron ore, as if on purpose for its reduction.

Besides coal and iron, Virginia contains gold, copper, lead, salt, limestone, marls, gypsum, magnesian, copperas, and alum earths; thermal, chalybeate, and sulphuretted springs; excellent marbles, granites, soapstones, sandstones, &c.

Ohio.—Were we to state that the whole of the south and eastern part of the state of Ohio was one magnificent coal field, we believe we should not vary far from the truth.

Kentucky.—About a mile from the Cumberland River, in Adair co. in boring for salt water, a bed of coal 45 feet thick was struck thirty feet below the surface, and at 150 feet beneath the coal a vein of salt water was reached, into which the auger dropped, and immense quantities of gas were discharged for a number of days. Indeed, coal and salt water may be said to abound from the heads of the Cumberland River to the heads of the Licking, occupying the whole of the northern and eastern borders of the state of Kentucky. West of this line iron ore is abundant.

Tennessee.—The coal of Tennessee is generally bituminous and of an excellent quality, burning freely, with much smoke and a white bright

* The *coking process* is now understood in Pennsylvania, and it is found that the bituminous coal is quite as susceptible of this operation, and produces as good coke as that of Great Britain. Indeed, it is now used to considerable extent in some of her iron manufactures.

flame, furnishing a good coke, and containing about seventy per cent of carbon.

Other Coal-Fields of the United States.—We have thus briefly described the most important coal-fields of our country which have as yet been explored: there are known to exist numerous others, which at no distant day will probably rise to an equal degree of importance. Such are those of Illinois, Alabama, Mississippi, and Indiana, some of which are already worked to a considerable extent, especially on the Wabash. We have, however, stated enough to satisfy the reader that nature has been most lavish in her distribution of this valuable mineral over the surface of our country, and in those very places, too, where it would seem to be most needed; and that no country on the globe can boast an equal amount of coal deposites with the United States of America.

IRON

is found in several states, in great abundance, and of good quality. Maine, New-Hampshire, Connecticut, New-York, New-Jersey, Pennsylvania, and Ohio, have extensive formations, and in inexhaustible quantities.

Iron Ore in Maine.—In the state of Maine the ores of iron are valuable and abundant; and at Woodstock, in the northern part of the state, bordering on the British provinces, there is one of the most extensive veins of this metal ever discovered. Dr. Jackson states that it is nearly 900 feet wide, and runs through an unknown extent of country. The ore is the compact red hematite, and yields 44 per cent of pure metallic iron, and 50 per cent of cast iron. By a simple calculation, it can be shown that, as a cubic foot of the ore weighs 200 lbs. if the bed were wrought to the depth of 100 feet, and 500 feet in length, it would yield 45,000,000 cubic feet of ore. A vein of magnetic iron ore exists on Marshall's Island, about three feet wide; and on the Aroostook River is a bed of red hematite iron of the best quality, 36 feet wide, and of immense and unknown length.

Iron Ore of New-York.—The state of New-York also furnishes an abundance of this useful metal. In Columbia and Dutchess counties the mines are numerous and easily worked, and free from water. These beds yield annually about 20,000 tons of ore, which is worth at the spot from $1.50 to $2.50 per ton. Within twelve miles of Amenia there are ten furnaces, which make 10,000 tons of iron per annum, and afford employment to 1000 men. There are several other furnaces in Columbia and Dutchess counties; and the aggregate value of the pig iron made at them all is estimated at $500,000 per annum. Much of this iron, especially that made from the bed in Amenia, which yields 5000 tons of ore per annum, is said to equal that from Salisbury. Much of the ore in these counties lies in a tertiary formation, under a deposite of pebbles, gravel and loam, and frequently, as at Amenia, at the junction of talcose slate and limestone.

Some idea may be formed of the immense quantity of iron in this region, when we state that at Newcomb, a few miles from the Hudson River, a bed has been traced more than a mile in length, and 300 feet in width; and about a mile north is another bed, 500 feet wide, which extends nearly a mile, and of an unknown depth.

In 1810, the quantity of bar iron made in the United States was 29,000 tons; in 1830, 112,860 tons, and also 191,536 tons of pig iron, of the value of $13,329,760. In 1810, the total value of our iron manufactures was estimated at $14,364,526. At present it exceeds probably $50,000,000, as there is not only a vast increase in the amount of the articles produced, but many new branches of manufacture have been introduced within the last few years.

GOLD.

The gold region of the United States may properly be said to extend from the Rappahannock, in Virginia, to the Coosa in Alabama. Gold has, however, been found in Lower Canada, Vermont, Massachusetts, New-York, New-Jersey, Pennsylvania, and Maryland, and it is therefore supposed by some that the gold deposites follow the primitive formation from Canada to the Gulf of Mexico. At Somerset, in Vermont, Professor Hitchcock thinks there is every indication of a gold region, and that it probably extends south into Massachusetts, as it has been discovered at Deerfield.

The richest gold mines in the United States are those of Virginia, North Carolina, and Georgia.

A full account of the mineral riches of the United States would fill many volumes; of those which remain undescribed, we can briefly notice but a few.

LEAD.

Lead is found in numerous places in the United States, but in few, however, in quantities sufficient to render its working profitable. It has been worked at Southampton and near Middletown (Connecticut), also in several places in Dutchess county (New-York), and at the Perkiomen mine in Pennsylvania. The most valuable locality of this mineral in the state of New-York is at Rossie, St. Lawrence county, where a vein two feet wide penetrates a ledge of rocks fifty feet high, and extends to an unknown depth.

One of the most extensive deposites of lead on the globe exists in what is called the mineral district of Missouri, which comprises parts of the counties of Washington, St. Genevieve, Jefferson, St. Francis, and Madison; extending a distance of about 70 miles in length, and from the Mississippi, in a south-westerly direction, about 50 miles in breadth. Besides a great abundance of lead, this region contains also iron, manganese, zinc, antimony, arsenic, plumbago, &c. The lead ore is the galena or sulphuret of lead. It is found in loose detached masses in the soil, and not in veins, in rocks, as it usually occurs, and yields about 70 per cent pure lead, and an annual product of several million pounds.

The total amount of lead from the U. S. lead-mines in Missouri, from 1825 to 1832, was 5,151,252 lbs.; and from 1821 to 1836, the product of the lead mines of Fever River amounted to 70,420,357 lbs.; giving a total from both these sources of 75,571,609 lbs.

COPPER.

Copper is found in many places in this country, in connection with lead and zinc, as at the Perkiomen lead-mine (Pennsylvania), Schuyler's

mines (New-Jersey), Cheshire and Wethersfield (Connecticut), Sing-sing (New-York), &c.; but, as the quantity is too small to be worked in many places to advantage, we pass it by. The same remarks will also apply to silver ore, a small quantity of which is contained in nearly all our lead ores.*

MANGANESE

occurs frequently in the form of an earthy oxide, resembling bog-iron ore, and is employed extensively in furnishing oxymuriatic acid for bleaching, communicating a violet or purple color to glass, in painting porcelain, and furnishing oxygen gas. It has not heretofore been in great demand, but there is no doubt it exists in quantity sufficient to supply the wants of the country.

PEAT.

Owing to the abundance of other kinds of fuel, peat has not yet been brought into extensive use, although it exists in inexhaustible quantities in many parts of the United States. Peat is derived from the vegetable fibres of partially decayed plants, or from decayed wood, which is called *ligneous* peat, though this is inferior to the other. The best peat lies at a depth of three or four feet, and frequently contains the trunks and branches of cedar and other durable kinds of wood, which have undergone little change. Though peat abounds in cold and wet regions, it is rarely found in warm climates, because vegetable decomposition is there too rapid to allow of the preservation of organic matter.

It is unnecessary to mention localities where this substance is found. Professor Hitchcock estimates, that in the eastern part of Massachusetts 80,000 acres, or 125 square miles, are covered with it, being an average thickness of six feet four inches. This would yield at least 121,000,000 of cords. Professor Mather remarks, that "peat is so common in every part of the first geological district (of New-York, embracing the southern part) that it may be found on almost every square mile. The value of peat-grounds is not yet fully appreciated; but when this combustible shall come into use, as it soon will, owners of those peat-lands which are convenient to a market must realize a large amount; and it should be remembered that these grounds, when dug once are not exhausted, like a coal mine, but in a few years, if properly managed, will be renovated, and afford a new supply. A peat meadow, with a thickness of only three feet, will give more than 1000 cords per acre. This combustible may be furnished at so low a rate that the poor may have an abundance of fuel. The odor of peat is unpleasant to some persons, but not more so than that of bituminous coal. Peat is usually cut out in pieces like bricks, by a kind of spade with a raised edge on one side, and is then dried like unbaked bricks, and afterward stacked or housed for use."

Every swamp either contains peat, or a vast amount of vegetable matter which may be usefully employed in agriculture. It may also be employed for producing gas-light, as in France. Peat is often used for manure, after rotting it with lime in the barn-yard or compost heap.

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* There are indications of a rich deposite of copper near Rossie, St. Lawrence county, New-York.

Peat is not confined to fresh-water lakes and marshes, but also abounds in those which are salt. Mather estimates that the first geological district of New-York contains at least 3,000,000 cords of peat, some of which has as great a specific gravity as bituminous coal, and is nearly or quite as valuable for fuel.

"Perhaps it would be saying too much," says Prof. Emmons, "to assert that peat is more valuable than coal; but when we consider that it contains a gaseous matter equal in illuminating power to oil or coal-gas, that its production is equally cheap, and, in addition to this, that it is a valuable manure if properly prepared, its real and intrinsic worth cannot fall far short of the poorer kinds of coal. There is one consideration which commends itself to the philanthropic of all our large cities, viz. the introduction of peat as a fuel to supply the necessities of the poor. It is believed that much suffering may be prevented, and much comfort promoted, by the use of peat in all places where fuel is expensive, as in New-York and Albany."

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We have heretofore noticed Oram's and other compressed fuels; and at an early date, shall publish the more recent improvements for converting peat into a substitute for coals; the cost of transporting the latter from the mines to this city rendering them much more expensive than compressed fuels, the components of which can be found in great abundance in our immediate vicinity.

DESCRIPTION OF AMERICAN PATENTS

Granted from July 10th to August 12th, 1840.

Improvements in Truss-Frames for Bridges. By WILLIAM HOWE, Warren, Mass. July 10th.

CLAIM.—What I claim therein as constituting my invention, and desire to secure by letters patent, is the manner in which I have combined and arranged the braces and counter-braces, the double posts, and the wedges between them, as shown in Fig. 1, so that by the driving of said wedges the truss-frame may be cambered in any desired degree; the whole being constructed and operating substantially as set forth.

I claim the manner of carrying the same principle into effect, by the combined operation of the wedges or keys over the arch beam, and those between the posts 3, 3, as shown in Fig. 3.

I claim the application of the same principle by an arrangement of braces and counter-braces, combined with an arch beam, the wedges or keys for combining being driven between the principal and resisting braces in the manner set forth, and represented in Fig. 7; together with such other modifications or variations of the same principle, by which the same end may be attained by means substantially the same.

Improvement in Water Wheels. By JOSEPH HANCHETT, Coldwater, Michigan. July 15th.

CLAIM.—What I claim as my invention and improvement, and which

I desire to secure by letters patent, consists in the arrangement of the guide-wheel upon the short axle F, as above described, in combination with the water-wheel, as suspended in stirrups fixed to the ends of short axles turned by levers, for changing the position of the centre of the water-wheel, in order to change the angle of the paddles, all as herein set forth.

Improvement in the Machine for Dressing and Jointing Staves. By HERVEY LAW, Wilmington, N.C. July 15th.

CLAIM.—What I claim as constituting my invention therein, and which I desire to secure by letters patent, is the manner of constructing and combining the part for dressing the faces of the staves, as set forth, with the curved box, constructed as set forth, and furnished with a series of jointing irons contained in stocks forming the upper and lower portions of said box; the faces of said plane stocks approaching the other on the concave side of the interior of said box for the purpose, and operating substantially in the manner herein set forth. I also claim the said curved box for jointing staves, in its individual capacity; the respective parts thereof being constructed and connected as herein described.

Improvement in the mode of manufacturing Fair Leather. By JOHN L. TURNER, Philadelphia, Pa. July 15th.

CLAIM.—What I claim therein as constituting my invention or discovery, is the employment of sulphuric ether to produce the required light or fair appearance in such leather, in the manner and under the conditions substantially as herein set forth. It is highly probable that some other of the ethereal fluids, such for example as nitric or muriatic ether, would produce an effect similar to that produced by sulphuric ether; but as the latter is perfectly effectual in its operation, and can be most economically obtained, I have not thought it necessary to essay the other kinds; but I do hereby declare that I do not intend to limit my claim to the use of sulphuric ether alone, but that I embrace therein and intend to use any of the fluids properly denominated ether.

Improvement in the mode of constructing Fire-Chambers for Stoves. By BENJAMIN F. and JOB S. GOLD, New-York. July 15th.

CLAIM.—What we claim as new, and wish to secure by letters patent as an improvement, is the construction of cast-iron chambers of combustion, substantially as above described, on the principle and for the purposes therein mentioned. We claim this improvement whether applied to all sides or to any part of the chambers.

Improvement in the Planing Machine. (Originally patented by him on the 28th of August, 1833, and for improvements on which he also obtained letters patent on the 9th of January, 1838.) By JAMES M'GREGOR, Jr. Savage Factory, Md. July 15th.

CLAIM.—What I claim therein is:—1. The construction and use of the guage for adjusting or setting to the proper rake and rankness the cutting or plane irons; the same being made and operating as herein

fully set forth.—2. I claim the combining with the original sliding frame of the grooving saw of my planing machine, the adjusting frame, screw and nuts, in the manner and for the purpose set forth.

Self-adjusting Log Brace for Saw-Mills. By BENJAMIN CUSHWA, Clearing Spring, Md. July 15th.

CLAIM.—What I claim as constituting my invention in the within described improvement in saw-mills, is the manner of using the shaft C, carrying the friction roller E, for supporting logs on saw-mills; the several parts connected therewith being combined together, and operating in combination with the carriage, substantially in the manner herein set forth.

Improvement in the expanding and contracting, or Universal Chuck for Lathes. By SIMON FAIRMAN, Waterford, N. Y. July 18th.

CLAIM.—What I do claim as my invention, and desire to secure by letters patent, is the method of securing together the front and back plates by means of the tube and nut, by which I am enabled to attach the front plate directly to the mandril or face plate of the lathe, all as above described. In like manner, I do not claim as my invention the rim on the front plate; but what I do claim as my invention is providing the rim with apertures through which the slides or holders can pass, for the purpose and in the manner above described.

Improvement in Stoves. By CHARLES R. WHEELER, Boston, Mass. July 18th.

CLAIM.—Having thus described my improvements in parlor grates, I claim in the same as follows: Constructing the hollow jambs, by making each of them with a vertical division plate, so as to conduct the smoke down on one side and up on the other, in combination with the cylinders placed between said flues, for the purpose of heating the air of the room; the whole being constructed, arranged and operating in the manner and for the purposes herein above described.

Improvement in Kitchen Ranges. By EBENEZER BARROWS, Rochester, Mass. July 18th.

CLAIM.—All that I claim being the manner of constructing and combining the three compartments constituting the fire-chamber and the side ovens, there being a free opening for the radiation of heat from the fire cylinder contained in the former into said side ovens, the latter being without flues either under or around their sides, and their ends being formed of brick. These form my combination, and to them I limit my claim.

Machine for cutting Match Splints. By JOHN H. STEVENS, assignee of ELISHA FITZGERALD, New-York. July 18th.

CLAIM.—I do claim as my invention and improvement, the knife, having a diagonal drawing stroke, in combination with the points used as guage teeth, in cutting off and separating match splints by one operation, as herein described.

Improvement in the Machine for sowing Cotton Seed, &c. By LEVIN MINER and NICHOLAS FELTS, Yanceyville, N. C. July 18th.

CLAIM.—What we claim as our invention, and which we desire to secure by letters patent, is the construction of the hopper, as before described, and the mode of supporting it in combination therewith, and in forming the beam with a moveable joint, to allow of the coverers and rake adapting themselves to inequalities of surface, and also in the mode of attaching the handles to the moveable and fixed part of the beam, as herein set forth.

Improvement in the mode of extracting the Alkali from Ashes in the manufacture of Potass. By JACOB OSBORNE, Elyria, Ohio. July 18th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the addition and application of alum, with lime and salt, in such proportions as will extract the whole of the alkaline properties of the ashes, and operate as a cleanser of the article produced, and not for inventing any new mode of washing them in the pot or pearl ashes.

Improvement in Cooking Stoves, having elevated Ovens. By LESTER TILDEN, Barre, Vt. July 18th.

CLAIM.—What I claim as constituting my invention, and desire to secure by letters patent, is the triple curved form given to the back plate thereof, for the purpose of concentrating the heat upon the boilers, in combination with the elevated oven, and with the separate flues EEE, leading from the three compartments of the body of the stove to the three pipes which connect them with the oven flue.

Improvement in the construction of Platform Balances. By ALBERT DOLE, Bangor, Me. July 18th.

CLAIM.—What I claim as my invention and improvement, and for which I desire to secure letters patent, is constructing the levers with bearing points beyond their centres or fulcrums, for the feet of the platform to rest upon, and placing upon the end of the long lever a vertical rod extending to the beam above and upon which it rests, the whole being constructed in the manner and for the purposes described.

Improvement in the mathematical operation of drawing Lottery Schemes. By JOSEPH VANNINI, New-York. July 18th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the mode herein described of forming lottery schemes by making tickets with a series of ternary and binary combinations with extra numbers on each ticket, and diminishing the number of tickets in every lottery, and regulating the drawing in the manner set forth.

Improvement in Mill Bushes. By JACOB AULABAUGH, East Berlin, Pa. July 18th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the mode of preventing the escape of the oil at the apertures through which passes the connection between the weight and

wedge, by the combination of the rod attached to the weight, the hollow stem, and the opening in the wedge into which the hollow stem fits, as herein set forth.

Improvement in Hydrants and Fire-Plugs. By S. H. DAVIES, Cincinnati, Ohio. July 18th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is placing the valve seats in a separate chamber (A) which is adapted to and made to screw on a chamber (A) connected with and opening into the main pipes, and fitting to the valve seats in said chamber, valves placed on a vertical stem passing through a tube connected with the upper part of the chamber, said stem being operated by springs in the manner and for the purpose herein set forth.

Improvement in the Spindle and Trundle-Head of Mills. By E. G. POTTER, Lebanon, Ill. July 18th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the manner of communicating motion to the spindle by the combination of the arms D D on the trundle-head, and the springs B B, attached to the spindle, as herein described, and as shown at Fig. 4, which is a perspective view of the combined parts.

Improvements in the construction of the Common Thumb-Latch. By PHILOS, ELI W. and JOHN A. BLAKE, New Haven, Ct. July 21st.

CLAIM.—In the construction of the thumb-latch as above described, we claim as our invention, and wish to secure by letters patent, the following particulars, to wit:

1. The inserting the shank of the thumb-piece in a slit or notch instead of a mortise in the handle-plate, combined with the resting it upon the lower end of that slit as a fulcrum, as herein described.

2. The resting of the thumb-piece upon its lower edge, as a fulcrum, combined with the mode of confining it to its place on that fulcrum, as herein described, to wit, by the wood at the upper end of the mortise through the door.

3. The crooking or offsetting the shank of the thumb-pin downwards, as herein set forth, for the purpose of forming a shoulder upon its lower edge to rest against the backside of the handle-plate, and to bring the bearing of the latch upon it more nearly on a level with the fulcrum.

4. The mode herein described of making and securing the pivot plate; that is to say, making it hollow, with an opening on one side for the latch to pass through, and securing it by a screw which at the same time passes through the latch and constitutes its pivot, as herein described.

5. The manner herein described of forming the staple; that is to say, removing that part of its plate which is behind the outer or front bar; thus admitting of that bar and the plate being readily cast in one piece, as herein set forth.

6. The modes herein described of forming the catch; either making it of a simple straight plate, to be let into and screwed within the rebate of the door-post, or of a plate bent at right angles to be screwed on the face of the door-post, thereby allowing it in either case to stand in a line

with, or close to said rebate, and consequently admitting of the shortening of the projecting end of the latch.

Improved Machinery for Turning. By John Clark, Jr. Mile End, Glasgow, North Britain. July 30th.

Claim.—I make no claim to the revolving cutters, or files, or grindstones, or grinding wheels by themselves, but only when they are used in the new combination of machinery herein before described.

Improvement in Smut Machines. By Hiram Smith, Bethany, N. Y. July 31st.

Claim.—What I claim as my invention, and desire to secure by letters patent, consists in the mode of constructing the cylinder by forming it with circular ledges Q, and oblique apertures A C, in combination with the revolving beaters, constructed and operating in the manner set forth.

Improvement in Mariners' and Surveyors' Compasses for ascertaining the Variation of the Needle. By William C. Poole, Lancaster, Pa. July 31st.

Claim.—What I claim as my invention and discovery, and desire to secure by letters patent, is the method herein described of obtaining the meridian line, and thereby ascertaining the variation of the needle by means of a compass constructed with a fixed and moveable reflector, and operating substantially in the manner set forth.

Improvement in Balances or Scale-Beams. By Seth E. Winslow, Philadelphia, Pa. July 31st.

Claim.—What I claim as my invention, and desire to secure by letters patent, is the construction of the single axle with double fulcra, for scale-beams and other scales, in the manner described.

Improvement in the manufacture of Paper; combining the operation of making, ruling, and cutting the Paper at one process. By John Ames, Springfield, Mass. July 31st.

Claim.—What I claim therein as constituting my invention, and desire to secure by letters patent, is the combining of the ruling and cutting machines with the drying cylinder, from which drying cylinder the paper is delivered in an endless sheet, said combination being made substantially in the manner herein set forth; the paper, when required, being successively ruled on both sides by means of two ruling cylinders and their appendages, in the manner described, and being conducted from the last cylinder to the cutting machine, also as described.

I likewise claim in combination with the ruling and cutting apparatus the manner of raising the pens on the second ruling cylinder, by means of the cam and its appurtenances, so as to leave the required portion of the paper unruled.

I do not claim either of the parts of these machines in their individual capacities, but only as connected and combined with each other, so as to produce a new and useful result, as here fully made known.

Improvement in Portable Shower-Baths. By J. WRIGHT WARREN, Jr. Boston, Mass. July 31st.

CLAIM.—1. I claim impregnating or medicating the vapor bath, by means of the tube *u u*, and hollow screw-stopper *v*, (with holes or openings *s' s'* in said stopper, through which the liquid in the cup *w w* will pass into the tube *u u*, when the stopper is unscrewed, as herein described) in combination with the conducting pipe C C, through which the vapor passes to the tub A A A A.

2. I claim the combination of the boiling or heating apparatus DDDD (constructed substantially as above described) with the bathing tub A A A A, and showering apparatus, consisting of a forcing pump Y, Y, conducting pipe *b' b' b' b'*, vessel *c' c'*, and showering tub *t' t'*, by which combination a shower bath of any required temperature may be obtained; and I also claim, in combination with the *showering apparatus* above mentioned, the discharge or alarm-pipe, for the object herein before set forth, and likewise the *circular curtain i i i i*, (for enclosing the bather while taking the shower bath) said curtain being operated by the several cords *l' l' l' l' l' l' o' o'*, working with the roller or cylinder *n'*, as explained in the foregoing description.

Improvement in the manner of constructing the Truss Frames of Bridges and other structures. By WILLIAM HOWE, Warren, Mass. August 3d.

CLAIM.—What I claim as constituting my invention in the above described truss frame, and which I desire to secure by letters patent, is the manner in which I have combined the iron bolts, and the wedge pieces against which the braces and counter-braces abut, so as to cooperate in increasing the camber to any desired extent; the whole truss frame being constructed and acting substantially as herein set forth.

Improvement in Smut Machines. By AMOS ADAMS, Port Henry, N.Y. August 3d.

CLAIM.—But what I do claim as of my invention, and desire to secure by letters patent, is the manner of constructing the revolving feeding screen, and of combining it with the body of the instrument in which the beating and agitation of the grain are effected, as herein set forth.

Machine by which the Centrifugal Force is controlled in throwing Balls and other bodies. By JOSEPH MARTIN, Louisville, Ky. Aug. 3d.

CLAIM.—What I do claim as my invention, and desire to secure by letters patent, is:—

1. The method described of controlling the centrifugal force of the balls and other bodies, by means of the combined operation of the chain wheels *d r*, *d r*, Fig. 4, drawing A; the endless chains T, T, T, T, with their receiving plates, the toothed wheels N, N, Fig. 5, drawing A; the centre wheel O, Figs. 1, 5, and 10, drawing A; the plate L, and shaft S, Fig. 2, drawing B. The above claim includes the various modifications of the same principle which have been described in this specification, or any other substantially the same in principle.

2. I claim the application of the spring-plates M, M, M, Figs. 5, 11, and 12, drawing A, and the guide-plates W, W, W, W, Fig. 4, drawing A, for receiving shot and regulating their discharge as described above, and the modifications of the same described in this specification.

3. I claim the method described above of regulating the point for the discharge of a ball or other body to be projected, by changing the position of the receiving plates or bars, relatively to the position of the outer terminations of the guide-plates; for effecting which either of the combinations of machinery acting upon the centre wheel, as shown in Figs. 1 and 10, drawing A, may be used, or any modification of the same, which may be substantially the same in principle.

4. I claim the discharging valves V, V, Fig. 10, drawing A, and Figs. 4 and 6, drawing B, in combination with the cams Q, Q, and the rods or levers X, X.

I have in this specification described methods by which my engine may be employed to propel machinery by projecting water on other bodies on common buckets, for which I do not claim a patent.

Improvement in the Mill for breaking and grinding Bark. By Richard Montgomery and Lewis W. Harris, Sangerfield, N. Y.

Claim.—What we claim as our invention, and desire to secure by letters patent, is the combination of the conical nuts, one or more, with the cylinders placed concentrically as herein mentioned and described, and constructed, arranged and connected in the manner herein described, and provided with teeth and pickers arranged, as is also herein mentioned and set forth.

Improvement in constructing the Packing for Pistons, Piston Rods, and Valve Stems of Steam-Engines. By Charles F. Pike, Providence, R. I. August 12th.

Claim.—What I claim therein, and desire to secure by letters patent, is the within described manner of packing the piston of a steam-engine, by the combined action of the conical wedge operating upon the sectional wedges, and these upon the divided rings—the conical wedge being adjusted by set screws, and the whole being constructed and operating substantially as set forth.

I do not claim the employment of divided rings to constitute the packing of a piston; these having been before used, but under an arrangement of the accessory parts essentially differing from that employed by me.

I also claim the packing of piston rods and of valve stems, by an arrangement of the respective parts constituting the packing, similar to that employed in the packing of pistons, but situated in a reversed order, the divided rings embracing the piston rods, or valve stems, as above made known.

Improvement in the Machine for Beveling Boot Forms. By Elijah Holmes, Stoughton, Mass. August 12th.

Claim.—I shall claim reducing or beveling the edges of boot forms, in the manner herein above explained, by revolving cutters, in combi-

nation with a frame for holding the boot form, the dead frame having projecting pins or guides traveling in grooves, for the purpose of presenting the form in a proper manner to the action of the cutters; the whole being arranged and operating together substantially in the manner herein above set forth.

LIST OF ENGLISH PATENTS

Granted between the 26th May and 26th June, 1840.

Henry Augustus Taylor, of New-York, now of Milk-street, Cheapside, merchant, for improvements in the manufacture of braid and plaits (being a communication from a foreigner residing abroad. May 28; six months to specify.

Alexander Francis Campbell, of Great Plumstead, Norfolk, esquire, and Charles White, of Norwich, mechanic, for improvements in ploughs and certain other agricultural implements. May 28; six months.

Sir Josiah John Guest, of the Dowlais Iron Works, Glamorgan, bart. and Thomas Evans, of the same place, agent, for certain improvements in the manufacture of iron and other metals. May 28; four months.

Edmund Leach, of Rochdale, Lancaster, machine maker, for certain improvements in machinery or apparatus for carding, doubling, and preparing wool, cotton, silk, flax, and other fibrous substances. May 28; six months.

Daniel Gooch, of Paddington-green, engineer, for certain improvements in wheels and locomotive engines to be used on railways. May 28; six months.

William Henry Smith, of York-road, Lambeth, civil engineer, for an improvement or improvements in the mode of resisting shocks to railway carriages and trains, and also in the mode of connecting and disconnecting railway carriages, also in the application of springs to carriages. May 28; six months.

George Henry Bursill, of River-lane, Islington, gentleman, for an improved method or methods of weighing, and certain improvements in weighing machines. May 28; six months.

James Allison, of Monkwearmouth, Durham, iron master, and Roger Lumsden, of the same place, chain and anchor manufacturer, for improvements in the manufacture of iron knees for ships and vessels. May 30; six months.

John Baptist Wicks, of Leicester, framework knitter, for improvements in machinery employed in framework knitting or stocking fabrics. May 30; six months.

William Pettitt, of Bradwell, Bucks, gentleman, for a communicating apparatus to be applied to railroad carriages. May 30; two months.

John Hawley, of Frith-street, Soho, watchmaker, for improvements in pianos and harps. (A communication.) June 1; six months.

Pierre Defaure de Montmirail, of London-wall, gentleman, for certain improvements in the manufacture of bread. (A communication.) June 2; six months.

Richard Freen Martin, of Derby, gentleman, for certain improvements in the manufacture of certain descriptions of cement. June 2; six months.

Samuel Salisbury Egales, of Liverpool, engineer, for certain improvements in obtaining motive power. June 2; six months.

James Harvey, of Basing-place, Waterloo-road, timber merchant, for certain improvements in paving streets, roads and ways, with blocks of wood, and in the machinery or apparatus for cutting or forming such blocks. June 2; six months.

William Southwood Stoker, of Birmingham, for certain improvements in machinery applicable to making nails, pins and rivets. June 2; six months.

Christopher Dain, of Edgbaston, Warwick, gentleman, for certain improvements in the construction of vessels for containing or supplying ink and other fluids. June 2; six months.

James Roberts, of Sheffield, merchant, for an improved mode of fastening certain kinds of horn and hoof handles to the instruments requiring the same. June 3; six months.

Samuel Wagstaff Smith, of Leamington, ironfounder, for improvements in apparatus for supplying and consuming gas. June 9; six months.

Robert Hampson, of Mayfield Print Works, Manchester, calico printer, for an improved method of block printing on woven fabrics of cotton, linen, silk, or woolen, or of any two or more of them intermixed, with improved machinery, apparatus and implements for that purpose. June 9; six months.

Alexander Southwood Stoker, of Birmingham, for improvements in the manufacture of tubes for gas and other purposes. June 9; six months.

Christopher Nickels, of York-road, Lambeth, gentleman, for improvements in the manufacture of braids and plaits. (A communication.) June 9; six months.

Thomas Edmondson, of Manchester, clerk, for certain improvements in printing presses. June 9; six months.

John George Shuttleworth, of Feamley-place, Glossop-road, Sheffield, gentleman, for certain improvements in railway and other propulsion. June 9; six months.

Francis Greaves, of Radford-street, Sheffield, manufacturer of knives and forks, for improvements in the manufacture of knives and forks. June 11; six months.

William Lance of George-yard, Lombard-street, insurance broker, for a new and improved instrument or apparatus to be used in whale fishery, part or parts of which upon an increased scale are also applicable as a motive power for driving machinery. June 11; six months.

Benjamin Winkles, of Northampton-street, Islington, copper-plate manufacturer, for certain improvements in the arrangement and construction of paddle-wheels and water-wheels. June 11; six months.

Joseph Wolverson, of Willenhall, Stafford, locksmith, and William Rawlett, of the same place, latch-maker, for certain improvements in locks, latches, and other fastenings for doors. June 13; six months.

Ezra Jenks Coates, of Bread-street, Cheapside, merchant, for certain

improvements in propelling canal and other boats. (A communication.) June 13; six months.

Edward John Carpenter, of Toft Monks, Norfolk, commander in the Royal Navy, for improvements in the application of machinery for assisting vessels in performing certain evolutions upon the water, especially tacking, veering, steering, propelling, casting, or winding and backing astern. June 13; six months.

Richard Beard, of Egremont-place, New-road, gentleman, for improvements in apparatus for taking and obtaining likenesses and representations of nature and drawings, and other objects. (A communication.) June 13; six months.

Richard Prosser, of Birmingham, civil engineer, and John James Rippon, of Well-street, Middlesex, ironmonger, for certain improvements in apparatus for heating apartments, and in apparatus for cooking. June 17; six months.

Richard Prosser, of Birmingham, civil engineer, for certain improvements in manufacturing buttons from certain materials, which improvements in manufacturing are applicable in whole or in part to the production of knobs, rings, and other articles from the same materials. June 17; six months.

Thomas de la Rue, of Bunhill-row, manufacturer, for improvements in printing calicoes and other surfaces. June 20; six months.

John Aitchison, of Glasgow, merchant, and Archibald Hastie, of West street, Finsbury-square, merchant, for certain improvements in generating and condensing steam; heating, cooling, and evaporating fluids. June 24; six months.

William Hickling Bennett, of Wharton-street, Bagnigge Wells-road, gentleman, for improved machinery for cutting or working wood. June 24; six months.

William Ash, of Sheffield, manufacturer, for certain improvements in augers or tools for boring. (A communication.) June 24; six months.

William Wood, of Wilton, carpet manufacturer, for certain improvements in looms for weaving carpets and other fabrics. June 24; six months.

Joseph Leese, jr. of Manchester, calico printer, for certain improvements in the art of printing calicoes and other surfaces. June 24; six months.

LIST OF PATENTS

Granted for Scotland, subsequent to the 22d May, 1840.

Thomas Walker, of Galashiels, in the county of Selkirk, mechanic, for improvements in apparatus applicable to feeding machinery employed in carding, scribbling, or teazing fibrous substances. Sealed May 26.

James Hadden Young, of Lille, in the kingdom of France, at present residing at 32 Norfolk-street, Strand, county of Middlesex, merchant, and Adrien Delcambre, of Lille, aforesaid, manufacturer for an improved mode of setting up printing types. May 28.

John Hawley, of Frith-street, Soho-square, county of Middlesex, watch-maker, being a communication from abroad, for improvements in pianos and harps. May 29.

Thomas Edmondson, of Manchester, clerk, for certain improvements in printing presses. June 1.

William Potts, of Birmingham, brass-founder, for certain apparatus for suspending and moving pictures and curtains. June 2.

Elijah Galloway, of Water-lane, Tower-street, London, engineer, for certain improvements in steam engines. June 9.

François Voûillon, of Princes-street, Hanover-square, county of Middlesex, silk mercer, being a communication from abroad, for certain improvements in the manufacture of ornamental woven fabrics. June 9.

William Daubney Holmes, of Cannon-row, in the city of Westminster, engineer, for certain improvements in the construction of iron ships, boats, and other vessels, and also in means for preventing the same from foundering; also, the application of the same improvements, or parts thereof, to other vessels. June 18.

John Crighton, jun. of Manchester, machine maker, for certain improvements in machinery for weaving single, double, or treble cloths, by hand or power. June 18.

List of Irish Patents granted in April and May.

John B. Humphreys, for certain improvements in shipping generally, and in steam vessels in particular; some of these improvements being individually novel, and some the result of a novel application of parts already known. April.

W. Craig and W. Douglas, for certain improvements in machinery for preparing, spinning and doubling cotton, flax, wool and other fibrous substances. April.

W. J. Cookson, for certain improvements in processes or operations for obtaining copper and other metals from metallic ores. April.

John Sutton, for improvements in obtaining power. April.

Samuel W. White, for improvements in preventing persons from being drowned. May.

W. Hunt, for improvements in the manufacture of potash, soda, and their carbonates. May.

T. R. Williamson, for improvements in the manufacture of woolen and other fabrics, or fabrics of which wool or fur form a principal component part, and in the machinery employed for effecting that object. May.

G. A. Ermer, for improvements in machinery or apparatus for spinning, doubling, twisting cotton, flax, wool or other fibrous materials, part of which improvements are applicable to machinery in general. May.

Sir W. Burnett, for improvements in preserving animal, vegetable, woolen and other fibrous substances from decay. May.

Thomas Meyerscough, for improvements in the construction of looms for weaving or producing a new or improved manufacture or fabric, and also in the arrangement of machinery to produce other descriptions of woven goods and fabrics. May.